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SUMMARY OF RECENT ABSTRACTS *

III. MALARIA †

[Continued from p. 274]

Treatment

A most lucid and authoritative exposition of the chemotherapy of malaria has been published by Covell *et al.* (p. 1157) as a WHO Monograph. It deals with the individual compounds now used, giving their composition and action, and it discusses drug resistance. Detailed instructions are included for the treatment of overt attacks, for anti-relapse treatment and for suppression. This is a most valuable publication. Gelfand (p. 745) also summarizes the treatment of malaria. Kikuth (p. 956) now thinks that with chloroquine and primaquine the problem of chemotherapy in malaria can be regarded as solved.

A general account of the vast amount of work done in the United States on malaria chemotherapy in the period 1946 to 1954 has been published by Schmidt and Coatney (p. 745).

Curative Treatment

Quinine is still used. Payet *et al.* (p. 746) inject intravenously 0·5–1·0 gm. in 5 cc. of a 25 per cent. solution of polyvinyl pyrrolidone as a daily dose; this is much more slowly eliminated than the usual solutions, and the blood level remains higher for longer periods.

The toxicity of mepacrine is referred to by Fischer (p. 1051), who reports a case of sensitivity, and Bruce-Chwatt (p. 331), who reports apparently permanent damage to the central nervous system of an

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1955, v. 52. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on malaria in this series see the March and April issues of the *Tropical Diseases Bulletin* each year since 1939.

infant treated with intramuscular mepacrine musonate for a symptomless fever, and pleads for more care in the use of this form of treatment in infants; chloroquine is much safer.

In a test of the value of proguanil in acute malaria Field *et al.* (p. 7) in Malaya found that the response in *Plasmodium falciparum* malaria was often slow, and that as time went on more patients failed to respond. Strains resistant to proguanil can be found in various parts of the country, but they are susceptible to chloroquine, amodiaquine, mepacrine and quinine. *P. vivax* and *P. malariae* responded slowly to proguanil, but the proportion of failures was low.

In India Dutta *et al.* (p. 507) found Resochin (chloroquine diphosphate), Nivaquine (chloroquine sulphate) and amodiaquine effective in various short courses. Rapid clearance of parasites was a feature.

Single-dose treatment was used successfully in village dispensaries by Chaudhuri and Dutta (p. 746), who obtained the best results with chloroquine (0·6 gm. base), amodiaquine (0·6 gm. base) and mepacrine (0·6 gm.); mepacrine was the cheapest. Patel and Balal (p. 8) found a single dose of amodiaquine (0·5 gm. base) effective in the treatment of acute attacks. In Honduras Hoekenga (p. 246) found that single-dose treatment of malaria (*P. falciparum* or *P. vivax*) with amodiaquine, chloroquine or hydroxychloroquine is satisfactory, but that pyrimethamine is less so. He comments that in endemic areas the immunity cannot be measured or re-infection controlled.

Mohr (p. 1167) sums up his experience with chloroquine diphosphate (Resochin), concluding that it is the safest and most reliable drug for malaria. It does not affect the exo-erythrocytic forms, however, and to prevent relapses of *P. vivax* malaria pamaquin or primaquine should also be used. In Ethiopia v. Tapavicza (p. 956) found that intramuscular injection of 0·15 gm. chloroquine base is a useful form of treatment, followed by oral administration if necessary. For comatose patients the dose can be given intravenously. After a careful trial in *P. falciparum*, *P. vivax* and *P. malariae* malaria in Malaya, Wilson and Edeson (p. 609) conclude that chloroquine in any form (diphosphate or monosulphate) is highly effective for acute attacks. It was more reliable and more rapidly effective than mepacrine and is regarded as the drug of choice for treatment and suppression. Most Malayan patients respond to a single dose of 0·6 gm. of base, or to 1·5 gm. in 3 days; a combination of oral and parenteral administration is used for heavy *P. falciparum* infections with complications. Similarly, in Malaya [presumably for the indigenous people] Laing (p. 1051) found a single dose of chloroquine sulphate satisfactory for *P. falciparum* infections. The oral dose was 0·6 gm. of base, the intramuscular dose 0·3 gm. and the intravenous dose 0·4 gm. Intravenous injection caused a transient fall of blood pressure [see also Harris, below].

Schneider *et al.* (p. 872) have been able to show that chloroquine and pyrimethamine, though different in chemical structure, toxicity and

mode of action, are apparently able as schizontocides to act as adjuvants to each other in *P. berghei*, *P. falciparum* and *P. vivax* infections.

Toxic effects of chloroquine have been recorded. HARRIS (p. 871) reports a fatality due to overdosage; a Caucasian child aged 1½ years was given an intramuscular injection of 0·3 gm. of base, and died within a few minutes, presumably as a result of a pronounced hypotensive attack. He points out that the dose should be 5 mgm. per kgm. of body weight. A pregnant woman took an overdose by mistake (the dose was not precisely known, but probably lay between 0·9 and 2·1 gm. of the base), and suffered from diplopia, sleepiness, depression of respiration and swallowing, paraesthesia, severe nausea and vomiting. She recovered completely in 36 hours (KJAER, p. 872).

In the indigenous inhabitants of Honduras hydroxychloroquine has been successfully used by HOEKENGA (p. 746) for the treatment of *P. falciparum* malaria by intravenous or intramuscular injection of 0·36 gm., or (for *P. falciparum* or *P. vivax* infection) by larger doses orally.

KENNEDY (p. 1167) reports a case of neutrophil leucopenia in a child after excessive use of amodiaquine, but as there was a history of illness a short time earlier, treated with a sulphonamide, Maegraith in comment considers the connexion with amodiaquine not proved.

In Mexico SOBERÓN Y PARRA (p. 332) used pyrimethamine in bird malaria, in which it acted as a suppressant, and in attacks of *P. vivax* malaria in man, in which he reports satisfactory results. As one-quarter of a group of soldiers treated for *P. vivax* malaria with pyrimethamine and quinine relapsed, BASS and MACFARLANE (p. 747) do not think that this is the treatment of choice.

An extensive investigation of treatment with pyrimethamine by DERN *et al.* (p. 747) failed to detect any toxic effects which could be attributed to the drug, but GUNTHER (p. 507) records the case of a young child who died as a result of consuming 16 tablets.

A controlled trial in India showed that treatment of *P. vivax* malaria with primaquine daily for 5 days was more effective as regards relapse and the clearance of gametocytes than treatment with quinine and pyrimethamine for 36 hours, followed by pyrimethamine weekly for 8 weeks (JASWANT SINGH *et al.*, p. 247). An American group of workers have investigated the haemolytic action of primaquine. By labelling erythrocytes of uniform age with radio-active iron BEUTLER *et al.* (p. 8) showed that young cells are insensitive to this haemolytic action but that older cells are susceptible. This suggests that a deficiency in one of the red cell enzymes may play a part in sensitivity to primaquine. In doses of 30 mgm. of base daily, primaquine was found by DERN *et al.* (p. 333) to cause haemolysis for several days in Negro volunteers, but this was followed by spontaneous return of haemoglobin values to normal in spite of continued administration of the drug. Various experiments were done with blood labelled with ^{51}Cr, and it seems that the cells may develop tolerance to the drug or that susceptible cells may be eliminated. Little

difference could be detected between red cells from normal and primaquine-sensitive persons (p. 334). A proportion of American Negroes have an intrinsic defect of the red blood cells which results in the development of acute haemolytic anaemia when primaquine is administered. DERN *et al.* (p. 509) now show that these cells are also unusually susceptible to haemolysis by certain aniline derivatives. The same authors (p. 510) have devised an *in vitro* test for the sensitivity of erythrocytes to primaquine, and in a biochemical study of such sensitive erythrocytes BEUTLER *et al.* (p. 610) found evidence indicating deficiency of sulphydryl groups, but whether as a cause or as a secondary effect is not clear.

Suppressive treatment

In Brazil PINOTTI (p. 10) has shown that chloroquine will withstand cooking for 3–4 hours at temperatures not exceeding 100°C. in media of *p*H 4–7, and has incorporated it in porridge. An amount of this containing 45 mgm. chloroquine base was given each day to a group of people with *P. vivax*, *P. malariae* or *P. falciparum* infections, with success. He now incorporates chloroquine in cooking salt (30 mgm. of base to 10 gm. salt) and this is used exclusively in some areas; parasite rates there have fallen sharply, but not in control areas.

Amodiaquine is much used. In Malaya WALKER (p. 1168) gave it and primaquine once each month to children and reports that *P. falciparum* was eliminated and *P. vivax* greatly reduced. DE MELLO and DE MELLO (p. 1052) have used it successfully in African children on a farm in East Africa. In a coastal town of French Equatorial Africa FABRE and JOIGNY (p. 1051) gave it at intervals of 2 weeks to African children. Within a year there was a marked decrease in spleen and parasite indices and a striking improvement in general health in these children, compared with a control group.

On the other hand, in a careful study in Accra COLBOURNE (p. 1168) found that a dose of amodiaquine at the beginning of each school term, followed by pyrimethamine once each week, certainly controlled malaria in a group of schoolchildren, and reduced absenteeism (which was not heavy in the controls), but gave no other definable benefit. He concludes that until it can be confirmed that a year's freedom from parasitaemia does not result in increased malaria in subsequent years, suppression in schools on a large scale cannot be justified.

Pyrimethamine has been used in weekly or monthly doses. ANNEKE and JACOBS (p. 435) report an experiment in suppression in part of South Africa where transmission is seasonal, with pyrimethamine in doses of 12·5 mgm. weekly in African children. The results were good compared with a control community, but in comment Covell points out that only one dose each month was given under the authors' supervision, the rest being left to the parents; in these circumstances the results are remarkable. In a village near Calcutta CHAUDHURI and CHAKRAVARTY (p. 336) gave it in weekly doses of 12·5 mgm. for children under 10 and of

25 mgm. for those over 10, with satisfactory results, though *P. falciparum* persisted in a few persons, being apparently less sensitive than other strains to the drug. In Panama CLARK (p. 123) has found doses of 25 mgm. weekly for 18 weeks useful for adults, and easier to administer than chloroquine.

In a rural area of the Belgian Congo DELANNOY and HUGON (p. 335) found pyrimethamine very suitable for children, in monthly doses of 12·5 mgm. for ages up to 5 years and of 25 mgm. for those aged 5–15. A controlled experiment in a holoendemic area of East Africa on the effect of monthly oral doses indicated that resistance was quite soon induced in *P. falciparum*. CLYDE and SHUTE (p. 248) think that resistance is acquired at a point in the excretion of the drug where the small quantity remaining fails to destroy the parasite, and that it represents ability of the parasite to compete favourably with pyrimethamine for essential nutrient tissue chemicals. Resistance may be induced if single doses of pyrimethamine are administered at intervals greater than 14 days. BRAY (p. 508) refers to this paper, pointing out that resistance is quickly built up and quickly lost, requiring constant treatment to maintain it at high level. ROLLO (p. 508) also thinks that resistance is labile, and he advises that prophylactic doses should be given at intervals not greater than one week—an interval recommended as a result of pharmacological and clinical studies. He challenges the statement made by CLYDE and SHUTE that pyrimethamine acts by blocking folinic acid and PAB.

In careful experimental work on volunteers infected with the relapsing Chesson strain of *P. vivax*, ARNOLD *et al.* (p. 9) conclude that primaquine has a very powerful effect on the tissue stages of *P. vivax* during the incubation period, and that weekly administration of 30 mgm. primaquine base combined with 300 mgm. chloroquine base may be of considerable practical use in controlling malaria in military personnel.

Milk diet (See also Plasmodium berghei, below)

MILLER (p. 334) tried the effect of a milk diet on Liberian children with malaria parasites in the blood, but the results were negative. He discusses possible reasons for this. In 10 patients with malaria who were given a milk diet but no other treatment, parasitaemia continued except in 5 of the 8 with *P. vivax* infection, in whom remissions occurred, but CHAUDHURI and DUTTA (p. 1166) think that these patients may have been semi-immune.

Control

General

A revised version of the circular on Malaria Control by Modern Methods has been issued by the Malaria Advisory Board of the Federation of Malaya (p. 12).

TOUMANOFF (p. 1052) advances the opinion that in Corsica some

anopheline species (including *A. maculipennis*) are breeding more prolifically in untreated mountain regions than they did before the breeding sites in the plains were subjected to antilarval treatment, but SAUTET (p. 436) claims that this mosquito had been equally prevalent in the mountains beforehand, though records (which he has now found) were scanty.

The older methods of control are still valuable. In an account of the anti-malaria work done in Morocco in the last 20 years HOUEL and DONADILLE (p. 11) make the point that antilarval measures are more important than in most other comparable countries. Residual insecticide spraying of dwellings has not produced important results, partly because the rural population is very scattered, and drug prophylaxis is hampered by lack of cooperation. Recent agricultural development and increase in irrigation and cultivation of rice have increased the malaria hazards, but rigorous precautions are taken. The large oasis of Ouargla in the Sahara has been rendered almost free of mosquitoes and malaria; MANDOUL and REJENET (p. 123) state that residual insecticides and chemoprophylaxis have not contributed significantly to the success of the campaign, which has been due almost exclusively to antilarval measures.

An account of the malaria control work done in Iraq from 1946 to 1952 is given by PRINGLE (p. 1053), who shows that the country is divided into 6 zones. One of these, round the Shatt-al-Arab, is the greatest date-producing area in the world, and the complex system of shallow water channels there encourages the breeding of *A. stephensi*, the main vector. Much antilarval work has been done in urban areas, and it is hoped that increased use of residual insecticides will achieve eradication there. Elsewhere canal systems also encourage *A. stephensi* and in certain areas *A. pulcherrimus* is exceedingly abundant, though a poor vector. *A. superpictus* may appear north of Baghdad, and has produced sharp epidemics. PALMQUIST and ALDRIDGE (p. 436) discuss the recent developments of malaria control in Persia.

MCARTHUR (p. 611) gives figures which indicate considerable reduction of malaria transmitted by *A. leucosphyrus balabacensis* in part of Borneo, by simple clearance of shading vegetation over the known breeding places.

In the Tennessee Valley the primary methods of mosquito control have been water management, shoreline improvement, aquatic plant control and larviciding. Recently DDT has been used from aircraft as a larvicide, and GARTRELL and LUDVIK (p. 124) state that there has been some indication of resistance in larvae of *A. quadrimaculatus* and in adults in sprayed houses. At a Californian lake where there was an epidemic of malaria in a girls' camp in 1952, a combination of marginal clearance, residual insecticides and larvicidal work has now eliminated the two anophelines concerned, *A. punctipennis* and *A. freeborni* (FONTAINE *et al.*, p. 436).

Insecticides

An important collection of papers on malaria control has been published in the *Bulletin of the World Health Organization* (p. 510) in which various authors discuss the possibility of eradication of vectors by residual insecticides (almost complete in the Guianas). Elimination is not easy, and experience has shown that certain anophelines (*A. aquasalis*, *A. superpictus* and *A. sergenti* for instance) appear to evade the action of the insecticides, largely because of their exophilic habits; moreover, the phenomenon of resistance is apparently becoming more prominent in *A. sacharovi*. Some of the authors emphasize the value of suppressive drugs used in conjunction with mosquito control.

A simple method for testing the toxicity of residual insecticides has been described by Afridi *et al.* (p. 586).

On the assumption that average age of mosquitoes caught in a village effectively sprayed with DDT would be lower than in an unsprayed village, Bhombore *et al.* (p. 249) estimated ages by the degree of wing fraying, but found, in fact, no distinct difference.

Although the Province of Salerno showed a considerable incidence of malaria before and during the war, Gallo and Savinetti (p. 1161) show that after intensive spraying of DDT malaria disappeared and anophelism became practically non-existent.

Belios (p. 748) states that in Greece *A. sacharovi*, *A. superpictus* and *A. maculipennis* have become resistant to DDT, and the first two to dieldrin, and *A. superpictus* to chlordane. No appreciable resistance has been found in the aquatic stages, but the resistance of adults appears to be increasing in both extent and degree. Livadas (p. 1053) gives details of tests which indicate great variability in susceptibility of *A. sacharovi* to DDT in different regions of Greece, and shows that the effect of other chlorinated insecticides used in houses of some areas has been of relatively short duration.

Morin (p. 1169) shows that in Yaoundé in the French Cameroons insecticidal sprays have been used since 1949. A survey has been made for a pilot control experiment in the surrounding country, to be conducted by WHO.

The recommended field dosage of oil solutions of DDT for use against anopheline larvae in East Africa is many times greater than the quantities required for complete kill in the laboratory, but Webbe (p. 748) shows that there is no real difference, and the discrepancy is probably the result of incorrect dosage (possibly due to obstruction by vegetation) in the field. *A. gambiae* larvae are more susceptible to dieldrin than to DDT, especially if the dieldrin is in oil. Dieldrin has given satisfactory results in a controlled test in South Africa, as a residual insecticide for the control of *A. gambiae* (Annecke, p. 513).

Rafi (p. 610) reports that in the Punjab the spraying operations with DDT for the second year of the programme have resulted in considerable

reduction (though not elimination) of malaria. In parts of India the villagers frequently limewash their houses in connexion with religious functions, but experiments conducted by Bhombore *et al.* (p. 12) on the limewashing of houses after DDT spray has been applied suggest that limewash does not appreciably affect the efficacy of DDT residue.

Residual insecticides appear to have been fully effective against the largely exophilic *A. minimus flavirostris*, an important vector in the Philippines, and Ejercito and his colleagues (pp. 513, 1055) describe a programme which combines long-range agricultural measures to reduce transmission with more immediate use of insecticides.

Portman (p. 336) gives an account of measures used to control mosquitoes (including *A. freeborni*) in the rice fields of California; they include the use of residual insecticides indoors for overwintering adults, and outdoors for control in the ricefields themselves. The point is made that *Culex tarsalis*, the vector of encephalitis virus, shows some resistance to DDT. DeCoursey *et al.* (p. 1149) show that, in certain conditions, insecticides seem to stimulate oviposition in *A. quadrimaculatus*.

After the end of the successful eradication programme with DDT in British Guiana, many thousand larvae and pupae of *A. darlingi* were introduced as a test of the duration of the lethal action of the insecticide used; Giglioli (p. 337) reports that intensive search failed to find any surviving specimens or breeding places deriving from the introduced insects. Floch (p. 12) from French Guiana reports that after 4 years of the use of DDT in spraying campaigns *Aëdes aegypti* and *Anopheles darlingi* have been virtually eliminated, and that malaria has almost gone, an unprecedented experience in that country.

Careful enquiry during the past few years indicates that the malaria campaign in Venezuela has resulted in actual elimination (by accepted criteria) from one area and that in another area elimination is rapidly being achieved. Gabaldon and Berti (p. 437) state that *A. darlingi* has been eradicated from most of the area but that *A. albimanus* still remains in some parts.

As a result of the full programme of residual insecticidal spray, wide use of larvicides and permanent work to eliminate breeding places, transmission of malaria has ended in Tobago, the catches of *A. aquasalis* having been reduced almost to zero (Gillette, p. 513).

In Guadeloupe control of anophelines depends on systematic and regular use of residual DDT and of larvicides along water-courses; Sautet and Aldighieri (p. 124) comment that control of *Aëdes* and *Anopheles* should be associated under the same direction.

Plasmodia of Animal Malaria

Adler (p. 125) discusses the classification of the malaria parasites, suggesting that the genus *Plasmodium* could be subdivided into a number of genera according to the site and type of the exo-erythrocytic forms, as in the family Haemoproteidae.

Plasmodia of Monkey Malaria

Ray and Nair (p. 749) show that the liver is considerably enlarged in monkey malaria, and argue that the same is true in human malaria, and that the state of the liver should be noted in malaria surveys. Ray (p. 338) shows that blood transfusion has a marked effect in preventing liver damage in rhesus monkeys infected with *P. knowlesi*, and suggests that it may be used with advantage in severe *P. falciparum* infection in man.

Jaswant Singh *et al.* (p. 514) give an account of the Nuri strain of *P. knowlesi*, and of successful experiments to render it resistant to pyrimethamine; resistance to this drug coincided with resistance to proguanil, bromguanide and their active metabolites. Ray *et al.* (p. 515) show that the active metabolite of bromguanide is about twice as active as the parent substance against *P. knowlesi*.

Experiments on blood-induced *P. cynomolgi* infections in monkeys suggest to Corradetti and Verolini (p. 250) that relapses in such infections originate from the erythrocytic forms of the parasite. Relapses in human malaria may be produced in a similar way. Splenectomized animals in which relapse does not occur can be reinfected with the homologous strain.

Lefrou and Martignoles (p. 749) inoculated blood containing *P. falciparum* into chimpanzees, and noted parasitaemia for up to 24 days, with some fever in one animal. They think that the names *P. schwetzi* and *P. reichenowi* should now be abandoned in favour of *P. vivax* and *P. falciparum* respectively, but in comment Garnham points out that no evidence has been produced that *P. reichenowi* can infect man. A study of *P. schwetzi* in chimpanzees and mosquitoes is reported by Rodhain (p. 956) who found that the mature oöcyst was considerably larger than the mature oöcyst of *P. vivax*, which constitutes the first morphological evidence of a specific difference between the two parasites. This strain was inoculated into several men, and low parasitaemia and several paroxysms (up to 11) were produced (Rodhain and Dellaert, p. 957).

Plasmodium berghei etc.

In the *Indian Journal of Malariology* (p. 1170) a long symposium on *P. berghei* was published, in which much modern work was reviewed; the long abstract of this collection of papers contains considerable detail.

Dutta *et al.* (p. 250) describe a method for electron-microscope study of *P. berghei*.

By inoculating *P. berghei* intravenously into embryos of chicks, ducks and geese, McGhee (p. 611) proved that the parasites could invade the duck and geese cells, though parasitaemia was low. The host-specificity of malaria parasites seems to be less rigid than is usually thought.

Durand and Mathis (p. 957) show for the first time that 3 hitherto

uninfected rodents—a mouse, a gerbil and a merion—are susceptible to *P. berghei*.

Various inbred strains of mice survived for different periods from 8 to 17 days after infection with *P. berghei*; Greenberg *et al.* (p. 126) found that hybrids, on the whole, survived longer.

Nadel *et al.* (p. 127) show that when *P. berghei* was inoculated into mice a few days after they had been inoculated with transplantable leukaemia, the survival time was slightly increased and the tumours were somewhat smaller than in controls. Malaria therefore has a slightly inhibitory effect in this condition, which is discussed.

Adler (p. 251) shows that whereas intraperitoneal injection of *P. berghei* kills normal golden hamsters in about 17 days, in hamsters previously infected with *Leishmania infantum* the *P. berghei* infection is much less fatal. In comment Garnham points out that *P. berghei* is highly sensitive to disturbances in its hosts—to dietary deficiencies, to presence of leukaemia, to hormone changes and to the "wrong" mosquito. It would be interesting to determine if these phenomena are the result of deficiency of essential metabolites.

In a study of the course of infection with *P. berghei* in a strain of inbred mice Singer (p. 13) observed that after intravenous infection there was a minor crisis about the fifth day, and that the parasite invaded 41 per cent. of reticulocytes against only 1 per cent. of mature cells.

In rats infected with *P. berghei* Zuckerman and Yoeli (p. 14) found that the older the animal, in general the less severe the infection, the change taking place chiefly at adolescence. In the youngest rats splenectomy reduced parasitaemia and delayed death, and fulminating parasitaemia (common in young intact animals) did not occur. However, splenectomy always had an adverse effect, the splenectomized animals always died if 20 per cent. of the erythrocytes were parasitized, whereas intact animals survived much heavier infections. After experiments in white rats on splenectomy before, and at different intervals after, infection, in which somewhat similar results were observed, Fabiani and Fulchiron (p. 15) conclude that the spleen exerts no action early in the infection, but that later it is essential to the development of specific immunity, though other tissues play a minor part.

Fabiani and Orfila (pp. 126, 251) show that in mice infected with *P. berghei*, reticulocytosis drops on the 3rd day for a few days but that the parasites apparently then attack mature erythrocytes. A study of ribonuclease, which is the maturation factor for reticulocytes, shows that the diminution of reticulocytes is due not only to destruction in the course of schizogony, but also to rapid maturation. The merozoites in fact invade the reticulocytes, which at that stage mature rapidly. There is no evidence of acquired immunity, and there are no means of predicting the course it will take. In experiments with white mice subjected to splenectomy and infected with *P. berghei*, these authors (p. 873) found that splenectomy interferes with reticulocyte production in the bone-

marrow. If reticulocytosis is artificially stimulated, multiplication of parasites progresses and is even enhanced when the spleen is removed, because the spleen provides a defensive mechanism of a limited kind.

Fabiani and Orfila (p. 340) have confirmed the value of sulphonamides in *P. berghei* infections of mice, but the effect depends on the individual host, the presence or absence of the spleen, and the strain of parasite used. As a result of treatment the host is able to develop an immunity to this otherwise lethal infection. They (p. 750) investigated the immunity provoked by *P. berghei* in white mice on a milk diet or treated with sulphonamides. The sera of the immunized mice showed more gamma globulin than sera of normal mice.

Some evidence of immunity was observed by Lapierre (p. 255) in mice which survived relapses after treatment of the primary attack of *P. berghei* infection.

Experiments on rats infected with *P. berghei* and later subjected to splenectomy indicate that for the acquisition of immunity the spleen is indispensable, but for maintenance of immunity it is merely useful (Fabiani and Fulchiron, p. 127). Rats which have recovered spontaneously from *P. berghei* infection show immunity to reinfection, but this begins to wane 15–18 months after the original spontaneous cure; Draper (p. 254) states that even before then it is not absolute.

Rodhain (p. 340) shows that there is no cross immunity between *P. berghei* and *P. vinckei* in young rats.

A detailed account of the cellular reactions to infection with *P. berghei* in white mice after intravenous inoculation, is given by Singer (p. 13). Highman *et al.* (p. 612) describe the pathological changes produced by *P. berghei* in resistant and non-resistant strains of white mice.

Electrophoresis revealed a rise in the serum gamma globulin of rats infected with *P. berghei*, which corresponded to the usual parasitolytic crisis 12–16 days after inoculation (Corradetti *et al.*, p. 751).

The effect of a milk diet has been studied. Fabiani and Orfila (p. 338) find it highly variable in infected mice; the effect seems to be on the blood or the blood-forming elements, or possibly directly on the parasite. Raffaele and Carrescia (p. 252) find that it protects mice, and that recovered mice show some immunity. In rats the diet led to a relatively mild infection, but splenectomy brought high mortality (Carrescia and Negroni, p. 516). On the other hand Corradetti *et al.* (p. 516) did not find any beneficial action in rats, and Galliard *et al.* (p. 749) report to similar effect in new-born rats. They discuss possible reasons for these discrepant results.

The effect of various diets on *P. berghei* infections in rats has been studied by Ramakrishnan (p. 253); details are given in the original abstract.

Fulton (p. 339) did not find any increase in parasitaemia in rats infected with *P. berghei* and treated with cortisone, and the infection in mice was not affected by the hormone, but the cortisone itself was

profoundly toxic to both rats and mice. Roberts (p. 253) observed that serum from mice with *P. berghei* infection treated with cortisone, when injected into mice with that infection, caused marked decrease in parasitaemia; she concludes that administration of cortisone enhances the production of humoral antibodies. Galliard and his colleagues (p. 254) show that administration of the pituitary somatotrophic hormone to mice infected with *P. berghei* tends to prolong the life of the mice; in rats the results are conflicting. They (p. 339) show that in young rats and mice hyaluronidase reduces the prepatent period of *P. berghei* infection, and increases parasitaemia. The enzyme acts by aiding diffusion.

Krishnaswami *et al.* (p. 15) prepared a strain of *P. berghei* resistant to sulphadiazine, by giving subcurative doses of the drug during serial passage, and they note that the strain remained sensitive to pyrimethamine, which, as Fulton points out in comment, was not the experience of one previous worker.

Rodhain (p. 128) shows that his strain of *P. vinckei*, after many passages, is now more virulent than before for white rats, killing most animals of under 30 gm., but none of those over 40 gm. He describes the course of infection.

Plasmodia of Bird Malaria

Huff (p. 256) records measurements of merozoites in infections of various birds with several species of *Plasmodium*.

Exo-erythrocytic forms of *P. gallinaceum* have been cultivated in tissue cultures of chick embryo liver and lung (Dubin, p. 256) and liver, brain and spleen (de Oliveira and Meyer, p. 1056); these are apparently the first records of such growth. Vasina and Zasukhin (p. 873) describe the infection of chick embryos from pieces of tissue containing exo-erythrocytic forms of *P. gallinaceum*.

Trembley and Greenberg (p. 340) have continued their studies on hybridization of strains of *P. gallinaceum*, one experiment suggesting genetic transfer of drug resistance (p. 517).

Volovik (p. 437) shows that in chicks infected with sporozoites of *P. gallinaceum* parasitaemia can be detected 1–2 days before they become infective to mosquitoes.

Geigy and Freyvogel (p. 128), having observed changes in the course of *P. gallinaceum* infection at high altitudes, conclude that these are due to improvement in non-specific resistance and activation of the reticulo-endothelial system at those altitudes. Weil (p. 1056), on the other hand, found little difference in the course of infection with *P. gallinaceum* of chicks infected after adaptation to high altitude in the Alps from similar infection of chicks at low altitude.

Ramaswamy *et al.* (p. 751) describe the histopathological findings in chicks infected with *P. gallinaceum*.

Huff and Marchbank (p. 1172) have studied the pattern of oöcyst production in several bird malaria parasites and several mosquito hosts.

The number of gametocytes fluctuated according to the parasitaemia; the number of oöcysts had little relation to the number of gametocytes; the oöcysts were most numerous in mosquitoes which fed early in the infection.

Ectopic oöcysts were found in a high proportion of *Aëdes aegypti* infected with *P. gallinaceum*. Weathersby (p. 612) shows that they were present in most tissues of the head, thorax and abdomen, and were of normal size and structure; no cellular reaction was present in their vicinity.

Indian domestic pigeons were found by Jaswant Singh *et al.* (p. 613) to be naturally immune to experimental infection with *P. gallinaceum*.

Narayandas and Ray (p. 257) fed *Aëdes aegypti* infected with *P. gallinaceum* on cotton-wool soaked in solutions of pamaquin, pentaquine or primaquine. Unlike some other authors they found that the drugs did not hamper the development of oöcysts.

Rollo (p. 958) has studied the action of sulphonamides, proguanil and pyrimethamine on *P. gallinaceum*. Proguanil and pyrimethamine may have a twofold action involving first an acceptor mechanism whereby the drugs interfere with the metabolic reaction, and second a "lethal" point of action within the metabolic pathway, probably by interfering with the conversion of folic to folinic acid. Greenberg and Bond (p. 16) show that resistance of *P. gallinaceum* to pyrimethamine does not always extend to related compounds. They suggest that resistance may be connected with the mode of attachment of certain substituents to the pyrimidine ring, and that, when this property develops, a concomitant change takes place in the parasite, involving an acceptor molecule.

Bishop (p. 257) has examined the action of certain pteridine derivatives on *P. gallinaceum* in relation to other compounds antagonistic to pteroylglutamic acid.

Jaswant Singh *et al.* (p. 16) give another list of compounds screened for activity against *P. gallinaceum* in chicks.

Whole milk was found by Greenberg *et al.* (p. 517) to delay parasitaemia of sporozoite-induced *P. gallinaceum* infection.

Chicks infected with *P. gallinaceum* and subsequently with the Rous sarcoma developed less extensive sarcomatous lesions than controls without malaria, and no metastases; Baranger and Filer (p. 15) have noted that persons on regular quinine suppression in malarial areas seem to be less subject to cancer than others.

Observations by Trager (p. 255) suggest that coenzyme A, an essential growth factor, is not synthesized by *P. lophurae*, but is accumulated by it from other sources.

Herman *et al.* (p. 129) studied the several species of malaria parasites of birds and the infection rates with malaria parasites of mosquito vectors of encephalitis in California. Three species of *Culex* were proved to be able to transmit *P. relictum* by bite. Sporozoites reached the salivary glands in as short a time as 4 days.

Okpala and Manwell (p. 613) point out that different species of bird malaria parasites react very differently to drugs, and they report trials of various standard drugs on *P. hexamerium* and *P. elongatum* in ducks.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

Grassi, G. & Oddo, F. Note sul problema della malaria nella provincia di Palermo. [**Note on the Malaria Problem in the Province of Palermo**] *Ann. d. San. Pubblica.* Rome. 1955, July–Aug., v. 16, No. 4, 787–807, 4 diagrams. English summary (9 lines).

The authors look back on the history of Sicily, more especially the province of Palermo, since the dawn of history. Malaria seems always to have been a scourge, periods of devastating prevalence alternating with periods of relative quiescence, the former always associated with economic misery and social upheaval. A short description is given of the physical geography and climatic conditions of the province, both of which favour an excessive prevalence of anophelines and the dissemination of malaria infection. *Anopheles m. labranchiae* is by far the most important vector; *A. superpictus* and *A. claviger* play only subsidiary rôles in transmission. The anti-malaria organizations and the measures adopted by them during the last 20 years, are outlined. Graphs illustrate the remarkable decline in malaria morbidity between 1944 and 1950 which resulted from DDT residual spraying of houses. Malaria has been almost completely eradicated but anophelines persist. *A. m. labranchiae* is relatively abundant in places but it no longer displays its house-haunting propensities. The possibility of the introduction of new strains of infection cannot be excluded. Should such an event reactivate malaria transmission the results might be grave as the population has lost the resistance to malaria it once possessed. *Norman White*

Morin, H. G. S. La capacité de production de gamètes par l'hématozoaire, facteur épidémiologique du paludisme. [**Capacity for Gamete Production by the Parasite as an Epidemiological Factor in Malaria**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 333–7, 1 fig.

Though the gametocyte density in a community is undoubtedly an important factor in the maintenance of the endemicity of malaria, there are several questions concerning gamete-production, which stand in need of elucidation. Thus workers in French West and Equatorial Africa have

been puzzled by the scantiness of sexual forms of the parasite detected in the course of extensive blood examinations in areas where malaria is hyperendemic.

In the present paper an attempt is made to elucidate this phenomenon from observations in the Cameroons, where *Plasmodium falciparum* is the predominant parasite. An analysis of the available records of blood examinations has revealed considerable variations in the proportion of gametocytes at different periods and in different cases. Thus, blood examinations made during the 15 months from April 1953 to July 1954, revealed 2·17 per cent. gametocytes in 5,640 blood films from hospital patients, whereas in 21,217 blood films from rural cases—represented chiefly by " healthy " carriers of all ages—the proportion of gametocytes was only 1·07 per cent. However, both groups showed a high proportion of asexual parasites, *viz.*, 20·54 per cent. in the former, and 13·45 per cent. in the latter group.

A comparison of the two groups thus shows that, among the hospital patients, there were 50 per cent. more asexual forms correlated with 100 per cent. more gametocytes, indicating that the parasites produced more gametocytes in clinical than in symptomless cases. Expressed per 100 of asexual forms, the figures for the gametocytes were: 10·61 for hospital patients and only 7·98 for the rural population. This notation (number of gametocytes per 100 schizonts), in the author's opinion, has certain advantages over the conventional gametocyte index.

In addition to the variation in different phases of the infection, the proportion of gametocytes was shown to fluctuate seasonally within the same group of people. It was also found that the marked fall in the number of recent infections, resulting from efficient mosquito control by insecticides, revealed in blood-films a rise in the percentage of gametocytes in relation to the asexual forms. However, these infections probably represented old-standing cases, and the prognosis of these findings was therefore good, since in *P. falciparum* the sexual forms are bound to disappear in one year. *C. A. Hoare*

Winckel, C. W. F. **Long Latency in *Plasmodium vivax* Infections in a Temperate Zone.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Sept., v. 7, No. 3, 292–8, 2 graphs. [20 refs.]

An account is given of the characteristics of *Plasmodium vivax* in the Netherlands, as an example of a strain in a temperate climatic zone, and a comparison is made with some strains from other regions. The Netherlands strain has a long latent period extending to 8 months; thus patients infected in the autumn have their primary attack in the following summer. The infection is transmitted by *Anopheles maculipennis atroparvus*, which in Holland is a semi-hibernating species whose infection is acquired in autumn from symptomless carriers. In malaria induced experimentally by the bites of numerous mosquitoes, this strain

may produce an early primary attack, though in about half of the cases the course is latent, on account of which this strain is unsuitable for malaria-therapy.

In comparing the local strain with others, it is noted that it is like the St. Elizabeth strain, which also runs a latent course, whereas the Korean strain occupies an intermediate position. As regards the Chesson and Madagascar strains, which typically produce early primary attacks, they are classified as "tropical" variants of *P. vivax* [but see Covell, this *Bulletin*, 1954, v. 51, 1217]. *C. A. Hoare*

Senevet, G., Andarelli, L. & Rehm, G. Anomalie chez une larve d'*Anopheles maculipennis*. [**Anomaly in a Larva of** *Anopheles maculipennis*] *Arch. Inst. Pasteur d'Algérie*. 1955, Sept., v. 33, No. 3, 279–80, 1 fig.

Laarman, J. J. **The Host-seeking Behaviour of the Malaria Mosquito** *Anopheles maculipennis atroparvus*. *Acta Leidensia* (*Scholae Med. Tropicae*). 1955, v. 25, 1–144, 19 figs. [Numerous refs.]
See this *Bulletin*, 1955, v. 52, 869.

van Someren, E. C. C., Teesdale, C. & Furlong, M. **The Mosquitos of the Kenya Coast; Records of Occurrence, Behaviour and Habitat.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 463–93. [25 refs.]

This paper is prefaced by a general geographical and climatic description of the coastal region of Kenya, and an explanation of various terms employed in the main body of the text. The major part of the paper is not amenable for brief description other than in the manner of the authors' summary, which is given below:—

"In this paper a list, with brief notes on prevalence, behaviour and habitat is given of 121 species, sub-species and varieties of mosquitoes taken in the last 12 years during field work on the Kenya coast. Two species and one sub-species of the mosquitoes found are not yet described. Notes on variation have been included for species that show interesting features in this respect and the distribution of the species in East Africa is also included where it is of interest." *D. M. Minter*

Peters, W., Cornelius Dewar, S., Bhalla, Bua D. & Manadhar, Tirtha L. **A Preliminary Note on the** *Anophelini* **of the Rapti Valley Area of the Nepal Terai.** *Indian J. Malariology*. 1955, Sept., v. 9, No. 3, 207–12, 1 map.

"1. A preliminary account is presented of the *Anophelini* of the Rapti Valley area of the Nepal Terai. This is the first account published to date.

" 2. A sketch map and description of the area are given. No detailed meteorological data were available.

" 3. 3,398 adult anophelines were captured in buildings between March and May and other examples were taken in the aquatic stages. Fifteen species and one variety were recorded: *A. fluviatilis*, *A. culicifacies*, *A. maculatus* and *A. splendidus* accounting for 91·8 per cent. of all adults captured.

" 4. The proportion of *A. fluviatilis* to *A. culicifacies* changed from 3:1 in March to 1:4 in May. *A. minimus* represented only 2·9 per cent. of all adult anophelines captured but was relatively commoner in the Chituan area.

" 5. Two specimens of *A. fluviatilis* were found infected, one in April and one in May. The Sporozoite Rate was 0·39 per cent. of 511 dissected during the three month period.

" 6. The anthropophilic index of *A. fluviatilis* was 21·2 per cent. (of 113 tested) and of *A. culicifacies* 12·7 per cent. (of 87 tested)."

Metselaar, D. **Some Observations on *A. karwari* James.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Sept., v. 7, No. 3, 193–6. [Numerous refs.]

Anopheles karwari has usually been recorded as breeding in water exposed to the sun or slightly shaded. Nothing is known of the outside resting places of the adults but they are often found indoors. Females attack man and animals and the latter appear to be preferred. The species is not of importance as a vector of malaria except perhaps in Malaya and there appear to be no records of natural or experimental filarial infections.

East of Celebes *A. karwari* occurs in the Australasian region near Hollandia in Netherlands New Guinea. Specimens from this area differ little from those obtained elsewhere, either in appearance or in bionomics; but from his observations and experiments the author concludes that *A. karwari* is an important vector of malaria near Hollandia and that it probably plays a part in the transmission of *Wuchereria bancrofti* in the Nimboran valley where filariasis is endemic.

H. S. Leeson

Vargas, L. & Martínez Palacios, A. Distribución de los anofelinos de México. [**Distribution of Anophelines in Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1955, June, v. 15, No. 2, 81–123, 8 maps. [24 refs.] English summary.

There are 27 species and subspecies of *Anopheles* in Mexico; this paper consists largely of a table occupying 37 pages listing nearly 800 localities in which these anophelines have been collected. Some species from

Central and South America have their northern limit in Mexico while others from U.S.A. have here the southern limit of their distribution.

H. S. Leeson

de Andrade, R. M. & Rachou, R. G. Levantamento preliminar de organismos planctônicos em alguns criadouros do *Anopheles darlingi* no Sul do Brasil. [**Preliminary Classification of Planktonic Organisms in Breeding Places of *Anopheles darlingi* in Southern Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Oct., v. 6, No. 4, 481–96. [20 refs.] English summary (3 lines).

This is a preliminary account of a hydrobiological survey of the breeding places of *Anopheles darlingi* in the village of Marques dos Reis in the State of Paraná, Southern Brazil. Lists are given of the flora and fauna collected from them. The distribution of the organisms among the breeding places is shown on 3 tables occupying 5 pages. Among the insects, in addition to *A. darlingi*, there were 4 other species of *Anopheles*. *H. S. Leeson*

Rachou, R. G., Lôbo, A. G. S. & Luz, E. Atualização da distribuição geográfica dos anofelinos do Estado do Paraná. [**Present Geographical Distribution of Anophelines in Paraná, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Oct., v. 6, No. 4, 525–32, 1 map. English summary (2 lines).

The authors present the geographical distribution of 27 species of Anopheline mosquitoes in the State of Paraná, Southern Brazil. Locality records are given in 2 tables on 5 pages and the distributions of *Anopheles darlingi, cruzi, bellator* and one unnamed species [? *bambusicolus*] are shown on a map of Paraná. *H. S. Leeson*

Hall, W. H. & Latts, E. M. **Pentaquine and Quinine in the Treatment of Korean *vivax* Malaria. A Controlled Study in 101 Patients.** *J. Lab. & Clin. Med.* 1955, Apr., v. 45, No. 4, 573–9. [23 refs.]

Between May 1951 and October 1952 101 consecutive cases of *P. vivax* malaria acquired in Korea were studied in young adult white males. Alternate patients were given chloroquine diphosphate orally (1·0 gm., 0·5 gm. daily for the next three days) or a combination of pentaquine and quinine (pentaquine 10 mgm., quinine 0·67 gm., thrice daily for 14 days). Fifty-two patients received chloroquine, 49 the combined therapy; 67 patients were followed up (presumably by questionary) for 13 to 30 months. Of 35 patients given chloroquine 9 had proved relapses, while in 32 given combined therapy there were no relapses. " Symptoms " of

malaria occurred subsequently in most of the former and in about one-third of the latter. The authors conclude after a review of the literature that the best treatment of acute *P. vivax* malaria might be " pentaquine or primaquine, 15 mg. daily, for 14 days with chloroquine, 1·0 Gm. the first day and 0·5 Gm. for the next three days ".

[The final recommendation has little to do directly with the experimental results. which, although clear enough, are expressed in the tables in infuriating percentages. Quotation from the discussion: " The radical cure of vivax malaria requires the destruction of the tissue parasites as well as those in the erythrocytes. . . . Pamaquine was one of the first drugs which seemed to have this property but *it proved to be too toxic*. . . ." (abstracter's italics).] *B. G. Maegraith*

Inder Singh. **Pyrimethamine in the Treatment of Malaria.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 145–57, 6 folding charts. [21 refs.]

This study was carried out on 86 patients with *P. vivax* malaria and 42 with *P. falciparum* malaria, with doses of pyrimethamine extending from 50 mgm. to 300 mgm. daily. The most effective scheme was found to be 150 mgm. daily on 2 successive days. With this dosage, in 79 per cent. of the former patients and in 50 per cent. of the latter fever subsided within 48 hours and in nearly all within 72 hours, but was followed by periodic spikes of temperature in 63 per cent. of *P. vivax* malaria patients and in 50 per cent. of those with *P. falciparum* malaria. Asexual parasitaemia persisted for longer than 8 days in 19 per cent. of cases of *P. vivax* malaria and in 12 per cent. of those with *P. falciparum* malaria; 11 relapses occurred within the first 80 days but none in the groups given either 150 mgm. daily for 2 days or 300 mgm. in a single day. The drug was fairly well tolerated but one patient vomited when given pyrimethamine in doses of 50 mgm. *Frederick J. Wright*

Pringle, G. **The National Campaign against Malaria in Iraq: Progress Report, 1946–1952, II.** *Bull. Endem. Dis.* Baghdad. 1955, July, v. 1, No. 3, 187–236, 1 coloured folding map.

For descriptive purposes Iraq was divided into the following 6 regions: (i) Shatt-al-arab and Hamar; (ii) alluvial plain; (iii) Syrian desert; (iv) steppe desert; (v) submontane and (vi) Zagros-montane. This second part of the progress report deals with the last 3 regions. [For the first part see this *Bulletin*, 1955, v. 52, 1053.]

Region (iv), undulating gravel steppe country, is divided along the basins of the main rivers, *i.e.*, the Tigris, Dyala and Zab. Steppe country is distinguishable from the higher submontane region mainly by the absence of springs, and lies between 200 and 1000 feet above sea-level. Malaria tends to occur in strips along the course of river beds

where during reduced summer flow *A. superpictus* breeds. Where there is perennial irrigation conditions are very favourable for the intensive breeding of *A. superpictus* and even *A. sacharovi*, with the attendant increased malaria risk. Such is the position in the Tigris-steppe. In the Dyala-steppe region there are scattered foci of rice cultivation associated with perennial streams and here large populations of *A. superpictus* and *A. sacharovi* occur with high endemicity of malaria. Commonly found also are *A. fluviatilis* and *A. pulcherrimus*. In the Zab-steppe terrain ancient canals were re-aligned and re-opened in 1941–42, again creating favourable conditions for *A. superpictus* with the result that the newly settled population suffered severely from malaria. In the Tigris-steppe response to the use of residual insecticides has been irregular; during the height of the malaria season most of the people sleep out-of-doors thus relieving the vector mosquitoes of the necessity of entering sprayed premises for a blood meal. In the other districts control has been limited largely to focal larviciding.

Region (v): The submontane region of Iraq occupies a roughly crescentic belt of undulating country, bordering the escarpment of the Zagros; it rises from steppe country to about 2,500 feet. An abundance of springs and natural seepages provide excellent breeding places for *A. superpictus* and *A. sacharovi* so that a summer epidemic of malaria falls on the villages with crippling regularity. Encouraging results have been obtained by the use of residual insecticides, where previously very limited larviciding was the only control measure.

Region (vi): In the Zagros-montane region the endemic levels of malaria are lower than in the submontane though high spleen indices have been reported from over 5000 feet; the valleys are only thinly populated. More favourable results have been obtained with residual spraying against the prevalent *A. superpictus*, probably because the malaria transmission season at these higher elevations is considerably shorter.

Although to date throughout Iraq where residual insecticides have been used results have not been dramatic, it is nevertheless intended to extend this method of malaria control to cover 3 million people in Iraq by 1958. It involves a steady extension of residual spraying over a predominantly rural population. The appearance of insecticide resistance is feared. The Report includes 36 pages of tabulated data according to locality, and it is expected that this data will provide a " base line " for all subsequent work. *R. Ford Tredre*

Nair, C. P. & Ray, A. P. **Studies on Nuri Strain of** *P. knowlesi*. **Part VII. Comparative Study on 4-Aminoquinolines.** *Indian J. Malariology*. 1955, Sept., v. 9, No. 3, 191–6. [12 refs.]

Infections with the Nuri strain of *P. knowlesi* have been used to test the 4-aminoquinolines Aralen and Avloclor (two different brands of

chloroquine diphosphate), Nivaquine (chloroquine sulphate) and Amodiaquine (camoquin) by the methods previously described [this *Bulletin*, 1956, v. 53, 157]. Altogether 72 rhesus monkeys were infected intravenously with 5 x 10^6 parasitized cells per kgm. body weight, and batches of 2 to 6 received oral doses of the drug varying from 1·5 to 3·5 mgm. per kgm. daily on 7 occasions, starting when the degree of infection was light. The progress of infection was followed in stained smears and the results were classified as described by Wiselogle [this *Bulletin*, 1947, v. 44, 1106]. The therapeutic effect of the 4 drugs did not vary greatly and the minimal effective dose [MED] ranged from 1·8 to 2·5 mgm. Their activity is compared with that against *P. gallinaceum* and *P. cynomolgi*. Attention is drawn to the correlation between the present results and those obtained with *P. falciparum*.

J. D. Fulton

Ray, A. P. & Nair, C. P. **Studies on Nuri Strain of** *P. knowlesi*. **Part IX. Susceptibility to Sulphonamide substituted Dihydrotriazine, Sulphadiazine and Mepacrine.** *Indian J. Malariology*. 1955, Sept., v. 9, No. 3, 197–202. [11 refs.]

Similar tests [see Nair & Ray, above] were made on 93 rhesus monkeys infected with the same parasite. A sulphonamide-substituted dihydrotriazine (the dihydrotriazine itself being a metabolic product of proguanil), as well as sulphadiazine and mepacrine were used. The superiority of sulphadiazine over the other drugs confirmed previous results, but the dihydrotriazine derivative showed little activity. The MED were 0·8 and 200 mgm. respectively while that for mepacrine was 6·0 mgm.

J. D. Fulton

Sergent, Ed. & Poncet, Alice. Étude expérimentale du paludisme des rongeurs à *Plasmodium berghei*. I. Incubation. Accès aigu. [**Experimental Study of** *Plasmodium berghei* **Malaria of Rodents. I. Incubation. Acute Attack**] *Arch. Inst. Pasteur d'Algérie*. 1955, June, v. 33, No. 2, 71–7.

The authors worked with the K173 strain of *Plasmodium berghei* which has now been through 527 passages in the white mouse without change of virulence. Of 1,426 mice inoculated intraperitoneally with an average of 19 million parasites, all died after an average incubation period of 1·4 days and 8·8 days acute parasitaemia. If the injection were subcutaneous, the incubation period was prolonged by one day. Of 372 adult white rats, inoculated intraperitoneally with 38 million parasites each, 6·7 per cent. died and the remainder recovered after an incubation period of 2·1 days and 12·5 days of acute parasitaemia; of 223 inoculated subcutaneously, 9·7 per cent. died, and the remainder recovered, after an incubation period of 5·8 days and 12·8 days of parasitaemia. In this last group, inoculated subcutaneously, 29 rats never showed parasites and

remained resistant to re-inoculation. They owed their resistance to a strong innate immunity.

In infected mice, the red blood count fell from 12 millions per cmm. to 1·5; in infected rats from 8 to 10 millions to less than 3.

The spleen of healthy mice weighed 200 mgm.; after death from *P. berghei* malaria, it weighed 300 mgm. The corresponding figures for white rats were 492·5 mgm. for uninfected and 932·8 for infected ones.

P. C. C. Garnham

Nadel, E. M., Greenberg, J., Jay, G. E. & Coatney, G. R. **Backcross Studies on the Genetics of Resistance to Malaria in Mice.** *Genetics.* 1955, Sept., v. 40, No. 5, 620–26, 2 figs.

The authors have previously shown that certain inbred strains of mice and their hybrids varied in the degree of resistance to infection with *Plasmodium berghei*, as manifested in the length of the period of their survival. They have later studied the survival time of hybrids of the 1st generation (F_1) with the parental strains and of that of hybrids of the 2nd generation (F_2) [this *Bulletin*, 1954, v. 51, 350; 1955, v. 52, 126, 127]. In the present paper they discuss the results of all the experiments, comprising 2,000 mice, belonging to 12 inbred strains and F_1 hybrids produced by 13 combinations of crossing between these strains, as well as F_2 hybrids and backcrosses.

The inbred strains fell into short, intermediate and long survival groups. Among the F_1 hybrids the majority exhibited increased resistance or heterosis, while the F_2 and backcross animals varied in their resistance. An analysis of these results indicated that resistance to malarial infection in mice has a genetic basis, involving multiple gene factors, though the wide range in the time of death, graphically expressed in a bimodal curve, also points to the existence of undetermined non-genetic factors.

C. A. Hoare

Durand, P. & Mathis, M. Evolution normale de l'infection à *Plasmodium berghei* chez la souris soumise au régime lacté. [**Normal Course of Infection with *Plasmodium berghei* in Mice kept on Milk Diet**] *Arch. Inst. Pasteur de Tunis.* 1955, Apr., v. 32, No. 2, 313–16.

The authors carried out experiments on the effect of a milk diet on malaria infection in mice. The majority of the animals (20) were kept exclusively on a diet of cow's milk, while a few (6) were fed on milk powder. After 10 days on this diet the mice were inoculated intraperitoneally with *Plasmodium berghei*. It was found that the course of the infection in the mice kept on a milk diet was similar in all respects to that in infected control animals; this diet therefore afforded no protection against infection with the malaria parasite.

C. A. Hoare

Loxley, O. J. R. **Effect of Indian Ink on *Plasmodium berghei* Infections in Mice.** [Correspondence.] *Nature.* 1955, Oct. 8, v. 176, 705, 1 fig.

In the case of malaria, blockade of the reticulo-endothelial system with Indian ink is generally thought to promote parasitaemia by lowering the resistance of the host [this *Bulletin*, 1942, v. 39, 441].

In the present paper the author describes experiments with *Plasmodium berghei*, in which an opposite effect was produced. In mice, which had received injections with heavy doses of Indian ink one day before inoculation of *P. berghei*, the infection was characterized by the occasional appearance of scanty parasites or low parasitaemia, in spite of a considerable increase of reticulocytes—for which the parasite usually shows a predilection—in the peripheral blood. *C. A. Hoare*

Fabiani, G. & Orfila, J. Étude physiologique des surrénales dans le paludisme expérimental de la Souris blanche. [**Physiological Study of the Suprarenals in Experimental Malaria of Mice**] *C. R. Soc. Biol.* 1955, Apr., v. 149, Nos. 7/8, 674–7.

As a rule, in mice infected with *Plasmodium berghei*, the infection runs an acute course, terminating fatally after 2–3 weeks, but in about 40 per cent. of cases death takes place after only a few days, with symptoms of shock [this *Bulletin*, 1955, v. 52, 251], the mechanism of which is unknown. In order to ascertain whether it might be due to acute suprarenal deficiency, the authors carried out the following experiments.

In one batch of mice, the suprarenals were removed before the inoculation of *P. berghei*, with the result that the majority died within 3–7 days, indicating that they were less resistant to the shock produced at the onset of infection. Another batch of similarly treated mice received injections of 2 mgm./100 gm. of desoxycorticosterone acetate (DOCA) every other day: in this lot only 4 animals died early, while a few, in which the suprarenals were removed in the course of patent infection, died several hours after the operation. In another experiment, infected mice with intact suprarenals received daily injections of DOCA, which did not alter the course of the infection, but only prolonged the prepatent period. However, daily injections of 2·5 mgm. cortisone were followed by a rapid rise in parasitaemia and early death of the animals, while with doses of 1 mgm. administered every other day, the infection reached the patent period and the infection lasted about 12 days.

Normally, in the course of malarial infection of mice, there is a drop in the number of eosinophils in the blood [this *Bulletin*, 1954, v. 51, 1197], but in animals from which the suprarenals have been removed their numbers reached several thousand per cmm. Thorn's test was carried out in a number of mice, by injection of corticotrophin: the results were positive at the onset of the infection and negative during

the patent period, while the injection of cortisone caused a fall of eosinophilia to 50 per cent. in a few animals.

It is concluded that the suprarenals have an important effect upon the malarial infection in mice, since in their absence its course is short, terminating fatally in several hours or days after the operation. The action of these glands is manifested in eosinopenia, which does not appear in mice deprived of them. *C. A. Hoare*

Jackson, G. J. **The Effect of Cortisone on** *Plasmodium berghei* **Infections in the White Rat.** *J. Infect. Dis.* 1955, Sept.–Oct., v. 97, No. 2, 152–9, 3 figs. [10 refs.]

The effect of cortisone on malaria infections has been previously recorded [this *Bulletin*, 1952, v. 49, 237, 672; 1953, v. 50, 87; 1954, v. 51, 764, 885; 1955, v. 52, 253, 339], but authors are not in general agreement. The present investigation deals with the effect of this substance on *P. berghei* infections in a small number of rats.

The animals were females weighing about 60 gm. and were kept at a temperature of about 70°F. alternately in light and dark for 12-hour periods. The treated animals were given a total of 20 mgm. cortisone acetate intramuscularly in 4 equal doses, 2 before infection and 2 following infection. The effect of cortisone on the blood picture was followed in infected and non-infected rats and the effect on parasitaemia in infected rats. The same observations were also made on normal rats and those infected but untreated with cortisone.

The results indicated that cortisone had a two-fold effect on *P. berghei* infections. There was a retardation of the infection and consequent increased survival time in the rats which was correlated with lower reticulocyte counts for some 2 weeks after drug administration. The higher mortality among cortisone-treated rats was thought to be due to the fact that defence mechanisms were adversely affected as a result of inhibition of lymphatic proliferative activity. *J. D. Fulton*

Pautrizel, R. & Martrenchar, C. Influence de l'histamine et d'un antihistaminique de synthèse sur la résistance du rat au *Plasmodium berghei*. [**Effect of Histamine and Antihistamine on the Resistance of Rats to** *Plasmodium berghei*] *C. R. Soc. Biol.* 1955, Apr., v. 149, Nos. 7/8, 698–700, 1 chart.

One of the authors has previously shown that the administration of synthetic antihistamines to animals inoculated with *Plasmodium berghei* favoured the development of parasitaemia but had no effect on relapses in the case of latent infections. The experiments described in the present paper were carried out in order to verify the hypothesis that antihistamines inhibited the activity of phagocytes.

In one experiment, rats were given 40 mgm./kgm. of promethazine

intramuscularly on the day of inoculation with *P. berghei* and next day. In another experiment, one batch of rats was treated in the same way, while rats of a second batch received intraperitoneal injections of 250 μgm. histamine, administered every half hour for 10 hours, on the day of inoculation. In both experiments, control animals were injected with saline. Treatment with antihistamine caused a rise in parasitaemia, whereas histamine produced the opposite result, in that the degree of parasitaemia was one-third of that in rats treated with antihistamine and one-half of that in the controls. This effect is attributed to stimulation of the development of the macrophages and of their phagocytic activities, resulting in greater destruction of parasitized red cells. *C. A. Hoare*

Singer, I., Hadfield, Rita & Lakonen, Marita. **The Influence of Age on the Intensity of Infection with** *Plasmodium berghei* **in the Rat.** *J. Infect. Dis.* 1955, July–Aug., v. 97, No. 1, 15–21, 5 figs. [13 refs.]

The purpose of the study described in this paper was to determine the cause of differences in age-susceptibility of rats to infection with *Plasmodium berghei*, in relation to the functional state of the erythropoietic system, and especially to the presence of reticulocytes. The results, which are presented in a series of tables and graphs, were as follows. In general, it was found that parasitaemia and survival were inversely related to the age of the rat, the mortality in animals under 28 days being over 90 per cent., whereas those older than 49 days recovered from the infection. There were corresponding differences in the degree of parasitaemia, which in fatal infections exceeded 100 per cent. of the red cells (including multiple parasitization). The parasites showed a definite predilection for reticulocytes, and only attacked mature cells after the immature ones were exhausted.

The course of infection in rats is considered in the light of their defence reactions. It is suggested that parasitaemia is limited by the availability of reticulocytes, but with increasing age of the host the infection is effectively controlled by the immune response. Since in young animals immunity is ineffective, reticulocytes continue to maintain the high level of parasitaemia until the host dies. *C. A. Hoare*

Rodhain, J., Wanson, M. & Vincke, I., with the technical assistance of M. Berteaux. Nouveaux essais d'évolution de *Plasmodium berghei* Vincke et Lips chez diverses espèces d'anophèles. [**New Attempts at Infecting Various Species of** *Anopheles* **with** *Plasmodium berghei*] *Ann. Soc. Belge de Méd. Trop.* 1955, Apr. 30, v. 35, No. 2, 203–17.

New attempts were made to find a suitable mosquito host of *Plasmodium berghei* by using recently isolated strains of the parasite in

different rodents. The authors fed 531 *Anopheles maculipennis atroparvus*, 159 *A. stephensi* and 13 *A. gambiae* on young rats on the third of fourth day of infection (with numerous gametocytes in the blood). The results were practically negative, so the authors changed to *A. maculipennis*, fed on 10 young hamsters; 319 were dissected and 11 showed oöcysts in the midgut, and 2 scanty sporozoites in the salivary glands. Lastly 1,309 *A. maculipennis* were fed on 20 hamsters, 3 days after inoculation; 600 were dissected and 10 per cent. showed oöcysts and sporozoites. In this final experiment some hamsters proved much better at infecting mosquitoes than others; for instance, one gave a rate of 2 per cent. oöcysts, another 20 per cent., another 29 per cent. and one even 59 per cent. The reason for this difference is unknown.

P. C. C. Garnham

Rodhain, J., Wanson, M. & Vincke, I., with the technical collaboration of M. Berteaux. Essai de transmission cyclique de *Plasmodium berghei*. [**Attempt to Transmit** *Plasmodium berghei* **Cyclically**] *Ann. Soc. Belge de Méd. Trop.* 1955, Apr. 30, v. 35, No. 2, 219–24. [13 refs.]

In experiments devised to observe sporogony of *Plasmodium berghei* [see above], the authors obtained a number of mosquitoes infected with sporozoites. They inoculated ripe oöcysts containing sporozoites into 2 young rats, a mouse and a hamster; they inoculated sporozoites from salivary glands into 3 young rats, 1 mouse and a *Thamnomys*; they allowed infected mosquitoes to bite 5 hamsters and one *Thamnomys*. None of the animals became infected, although the experimental conditions were all good (*e.g.* rapid transfer of sporozoites to the host). The sporozoites were in small numbers and were probably in a degenerate condition because the mosquito they used (*Anopheles maculipennis atroparvus*) was an unnatural and inadequate host. This is confirmed by the rapid disappearance of sporozoites from the salivary glands of infected mosquitoes; none was found 20 days after the first blood meal.

P. C. C. Garnham

Taliaferro, W. H.; Taliaferro, Lucy G.; Moulder, J. W. **Reactions of the Connective Tissue in Chickens to** *Plasmodium gallinaceum* **and** *Plasmodium lophurae*. **I. Histopathology during Initial Infections and Superinfections** [Taliaferro & Taliaferro]. *J. Infect. Dis.* 1955, Sept.–Oct., v. 97, No. 2, 99–136, 7 text figs. & 34 figs. on 10 pls. [41 refs.] **II. Glucose Metabolism during Initial Infections** [Moulder & Taliaferro]. *Ibid.*, 137–42, 1 fig.

I. This investigation deals with the changes in connective tissues occurring in chickens, 589 in all, during initial infection and superinfection with *Plasmodium gallinaceum* or *P. lophurae* induced by sporozoite

or erythrocytic forms of the parasites. The age of the host and dosage were also taken into account. Histopathological findings are presented with regard to changes in innate and acquired immunity. Some of the techniques were those used previously by the authors [this *Bulletin*, 1947, v. 44, 40]. The chicks were kept for periods of 12 hours on an alternate light and dark schedule. In initial infections with the two parasites hypertrophy of spleen and liver occurred and the detailed changes in the connective tissue of these organs, in bone-marrow and in other tissues are described. Similar details are given for superinfection with the homologous organism. The rise and fall in phagocytic activity described in earlier experiments with malaria-infected animals were confirmed. This activity was correlated with the degree of infection and of immunity acquired. The most active tissues were spleen, liver and bone-marrow. In regard to antiparasitic and other aspects of immunity the importance of mesenchymal reserves is stressed. They include both fixed and free cells whose activity is best seen in the lymphatic and myeloid tissues of the spleen and bone-marrow.

As a result of the immunological process there was marked destruction of engorged macrophages by other macrophages. Destruction of lymphocytes and other lymphoid cells, of granulocytes, parasites and their débris, as well as of intact and parasitized red cells, also took place. Lymphoid activity was closely correlated with the number of nodules in the spleen, which appeared and reappeared according to the manner in which infection was induced.

While the immunological aspects of the work have been concerned with the erythrocytic stages of both parasites, the authors conclude from their observations that immunity is also operative against exo-erythrocytic forms of the parasite.

II. In continuation of the work described in the preceding abstract, the aim of the present investigation was to find whether the changes in the connective tissue described there are associated with changes in metabolism of the host tissues. As a measure of general metabolic activity the rates of aerobic and anaerobic breakdown of glucose in spleen slices were studied, because increase in weight and evidence of tissue alteration were greatest in this organ. Parasite counts were made regularly and histological sections of the organs studied at the same time. Slices of spleen 0·33 mm. thick were used to measure O_2 uptake and CO_2 production. Glucose consumption was measured at 4 different stages of the infection, but, in spite of the histological changes observed in the infected spleen, it was almost the same as in normal spleen. The same was true for O_2 uptake and CO_2 production. This absence of glucose metabolic changes in infected tissue is not of general application. The enlargement of the chick spleen during malaria infection involves an increase in tissue with the same metabolic characters as those in the uninfected host.

J. D. Fulton

Muniz, J. & Soares, R. de R. L. Nota sôbre um parasita do gênero *Plasmodium* encontrado no *Ramphastos toco* Müller, 1776, "Tucano-açu", e diferente do *Plasmodium huffi*: *Plasmodium pinottii* n. sp. [**Note on a** *Plasmodium* (*P. pinottii*, n.sp.) **found in the Toucan,** *Ramphastos toco*, **and differing from** *P. huffi*] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, Oct., v. 6, No. 4, 611–17. English summary.

In an attempt to isolate a new strain of *Plasmodium huffi* from the toucan [see this *Bulletin*, 1952, v. 49, 604], the authors encountered another parasite which they have called *P. pinottii*. On this occasion the bird was found in the littoral of Brazil, and the new parasite is being maintained in the Instituto Oswald Cruz. Its asexual cycle in the blood is probably 24 hours, and the morphology is that of a large avian *Plasmodium* producing 6–18 merozoites, with elongate gametocytes. The exo-erythrocytic and sporogonic cycles are unknown. Unlike *P. huffi*, which is restricted to the toucan, *P. pinottii* is capable of infecting at least 12 species of birds; the authors therefore called the former parasite stenoxenous and the latter, oligoxenous. The pigeon and young chicks are the most susceptible hosts and these birds nearly always die of the disease between the 7th and 9th day, with 90 per cent. of the corpuscles parasitized. *P. C. C. Garnham*

BLACKWATER FEVER

Soromenho, L. **Blackwater Fever. Its Etiology and Treatment.** *South African J. Lab. & Clin. Med.* 1955, June, v. 1, No. 2, 110–17, 1 fig.

The author contends that blackwater fever is caused by infection with a treponeme named by him *Spirochaeta mozambicana*. Upon this slender and trivial hypothesis is based a remarkable programme of treatment, which includes "no food whatsoever so long as the temperature remains above 37°C (97°F)". [This should, of course, be 98·6°F.]

[Those interested may safely overlook this paper.] *B. G. Maegraith*

Porte, L. Nouveau cas de fièvre bilieuse hémoglobinurique traité par la Cortisone. [**New Case of Blackwater Fever treated with Cortisone**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 389–93, 1 fig.

The author describes a second case [this *Bulletin*, 1954, v. 51, 680] of blackwater fever treated with cortisone. The patient was an African and had had a previous attack 5 years earlier. On the day of admission the patient received 25 mgm. cortisone orally every six hours, together with Flavoquine [amodiquine], cardiac tonics, vitamins B1, C and cocarboxylase. Next day, because of nausea, he was given cortisone

100 mgm. intramuscularly morning and evening. Doses of 50 mgm. intramuscularly and 100 mgm. orally were given the following day; the next two days 100 mgm. daily and the following day 50 mgm. orally. Total dose of cortisone was 700 mgm. given over 6 days.

On admission the red cell count was 3·7 million cells per cmm., there was massive haemoglobinuria and the urinary volume was 500 ml. Next day the patient was jaundiced, haemoglobinuria was intense, but the urinary volume was 2,000 ml. On the third day the pigments were lighter and the volume remained the same. The next day the appearance of the urine was unchanged and the volume was 3,000 ml. Red cell count was 2·67 million cells per cmm.; the urine was clear of haemoglobin by the evening and the urinary volume 3,200 ml. The following day the red cell count was 1·72 million cells per cmm. The urine remained clear thereafter, the volume gradually dropping to about 1,500 ml. The erythrocyte count rose rapidly reaching about three million cells per cmm. 6 days later. Recovery was uninterrupted.

The author points out that the treatment, which seemed to lead to strong diuresis, did not apparently affect the prevailing haemolysis and that although transfusion of blood was not used, the erythrocytes were very quickly re-established. *B. G. Maegraith*

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Colonial Office. **Colonial Research 1954–1955. Tsetse Fly and Trypanosomiasis Committee. Report for 1954–1955** [Monson, W. B. L., Chairman] (pp. 259–75) Cmd. 9626. 316 pp. 1955, Nov. London: H. M. Stationery Office. [9s.]

The scientific parts of this section summarize the work carried out during the year 1954–55 at the Committee's Tsetse and Trypanosomiasis Research Organizations in East Africa [see this *Bulletin*, 1956, v. 53, July] and West Africa [*ibid.*, 1955, v. 52, 958], and through Colonial Schemes in some other Territories.

In Northern Rhodesia, the tsetse survey already begun was almost completed; a report is expected early in 1956. Tsetse control in the Mulungushi Dam area, east of Broken Hill, was continued and proved entirely successful within the area treated; spraying of "Lusaka" thicket with arboricides, reported for the previous year, proved unsatisfactory, and it is hoped to renew the experiment with a different technique.

Gold Coast work included an investigation of the bionomics of 9 species of tsetse fly in 5 different ecological zones, and infectibility experiments with *Trypanosoma vivax* in *Glossina palpalis* and *G. tachinoides*. Further observations were made on animals experimentally infected with *T. vivax*, *T. congolense* and *T. brucei*.

The effect of mineral supplements on resistance to *T. vivax* in calves, being studied at Entebbe, Uganda, was continued, and an investigation into the bionomics and control of biting flies other than tsetse has been commenced.

The Sub-Committee on Game reports near completion of a survey of game species in Africa, and of a biological study of Thomson's gazelle in Tanganyika. *N. R. Phillips*

Fromentin, H. Essais de création d'une souche " hybride " par mélange de trypanosomes polymorphes d'espèces différentes. [**Attempts to produce " Hybrid " Strain by mixing Different Species of Polymorphic Trypanosomes**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 414–21.

Culwick *et al.* [this *Bulletin*, 1952, v. 49, 23] claimed that, by mixing *Trypanosoma brucei* with *T. rhodesiense* or *T. gambiense*, they could produce a " hybrid " strain which differed in length from the " parent " species and was not infective to man. Similar experiments were carried out by Vaucel and Jonchère [5th Meeting of the International Scientific Committee for Trypanosomiasis Research, see *ibid.*, 1955, v. 52, 1057], who came to the conclusion that in mixed infections of *T. brucei* and *T. gambiense* the latter was " swamped " by the former.

In the present paper the author describes the results of her experiments on mixed infections with laboratory strains of *T. gambiense* and *T. brucei*. When a mixture of equal numbers of trypanosomes of each species was inoculated into rats and underwent 17 passages through these animals, the mean length of the strain gradually diminished from 30·1 μ in the 1st passage to 20·4 μ in the 15th, its length in the 12th passage (22·4 μ) being equal to that of *T. brucei* when maintained in rats. However, in 6 subsequent passages through guineapigs the mean length rose again, reaching 27·4 μ, which corresponded to the length of *T. brucei* in these animals. Furthermore, a statistical analysis of measurements of parallel rat passages of *T. gambiense*, *T. brucei* and their mixture, showed no significant difference ($P>0·3$) between pure *T. brucei* and the mixed strain (*T. gambiense* + *T. brucei*), indicating that both belonged to the same species. When the 3 strains (*T. gambiense*, *T. brucei*, and a mixture of the 2) were kept in citrated blood for 3 hours, the mean length of the mixed strain (22·3 μ) was intermediate between those of the 2 pure strains (23·9 μ and 20·2 μ respectively).

From these observations it is concluded that in mixed infections of

T. gambiense and *T. brucei* the former species is merely "swamped" by the more rapid multiplication of the latter, and there can be no question of the production of a "hybrid" strain. This conclusion is also supported by the following observations: (a) the incubation period and duration of the infection both with the mixed strain and *T. brucei* were 24 hours and 3–5 days respectively, compared with 3–6 days and 9–15 days respectively in the case of *T. gambiense*; (b) human serum exerted trypanocidal and curative actions both on the mixed strain and *T. brucei*, but not on *T. gambiense*; (c) there was cross-immunity between *T. brucei* and the mixed strain, for the serum of rats infected with the latter protected against infection with the former, while the serum of guineapigs infected with either strain protected against both, but neither of these sera afforded protection against infection with *T. gambiense*; and finally (d) the inoculation of the mixed strain into a schizophrenic patient failed to produce infection, whereas *T. gambiense* alone infected another patient. *C. A. Hoare*

Jackson, C. H. N. **The Natural Reservoir of** *Trypanosoma rhodesiense*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 582–7, 3 maps.

A modified and extended form of the author's summary is as follows:—

While engaged on tsetse research duties in 3 different places closed to settlement on account of sleeping sickness, 27 Africans became infected with *Trypanosoma rhodesiense*; details of three cases are lacking. *Glossina morsitans* was the responsible vector, and in addition a strain of *T. rhodesiense* was obtained from a wild *G. pallidipes*.

Most (23) of the cases occurred about Kakoma, Tanganyika; the 20 with available data were distributed between 8 localities, and 8 of them occurred in camps some miles removed from any permitted route. The other areas were Lugala, in Uganda, where the *G. pallidipes* infection was recorded, and Daga-Iloi in Tanganyika. Maps show the areas concerned, and the distribution of cases in the Kakoma area.

It is the author's conviction that wild animals [a comprehensive list of which is given for the Kakoma area] must form a reservoir of the disease in nature, as they have been shown to do experimentally.

N. R. Phillips

Jackson, C. H. N. **The Pattern of** *Glossina morsitans* **Communities.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 517–30, 5 figs.

Tsetse flies (*Glossina morsitans* Westw.) were marked, by a method described elsewhere [this *Bulletin*, 1953, v. 50, 800], and released at Daga-Iloi, Tanganyika, over a period of 15 months. The flies were marked and released at a series of 75 catching points, 100 yards apart,

and situated on an octagonal spiral the successive rings of which were 250 yards apart.

The topography of the area is briefly described; the animals occurring, mostly ungulates, are listed.

G. morsitans was found to be most numerous in tall *Brachystegia* woodland on moderate slopes, and where open grasslands were not far away.

During the rains, well-marked concentrations of flies occurred in parts of the *Brachystegia* woodland. The hungriest flies were always found outside the *Brachystegia*, and hunger was judged to be higher in the dry season, as measured by the proportion of non-teneral males alighting head-upwards on members of the catching party. A negative correlation between numbers of flies and numbers of ungulates was found, and a positive correlation between the number of ungulates and hunger of the flies. This finding accords with the feeding-ground theory. Certain movements of individual flies were also in agreement with the theory, but the possibility that flies caught in the putative feeding-grounds may have been attracted there solely by the presence of the catching party is considered by the author to deserve careful examination.

The passage of buffalo herds through parts of the catching spiral was not apparently accompanied by mass movements of flies, even when the animals passed by day and many flies fed on them. *D. M. Minter*

Weitz, B. & Jackson, C. H. N. **The Host-Animals of** *Glossina morsitans* **at Daga-Iloi.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 531–8.

Blood smears from 378 examples of *Glossina morsitans* Westw. were collected on the spiral fly-round at Daga-Iloi, Tanganyika [see above]. The flies were nearly all males in Stage 1 of hunger (*i.e.*, the blood was visible externally).

The smears were collected by expressing the stomach contents on to filter papers which were then dried over calcium chloride, and the serum proteins were later extracted in 0·9 per cent. solution of sodium chloride, for a period of 12 hours at 4°C.

Two types of test were performed on the extracts thus obtained; precipitin tests and a newly developed technique, shortly to be described elsewhere, the inhibition test. The latter technique was used for mono-specific tests, by the inhibition of agglutination of red blood cells tanned with tannic acid.

That these two tests were reliable was checked against a number of known feeds, the identity of which were not known to the operator until after the tests were completed. This showed clearly that precipitin tests with absorbed rabbit sera were capable of distinguishing Primates, Suidae, Equidae and Bovidae; and that the inhibition test was equally successful in specific determination within the above groups.

The results of the above tests on the 378 smears are tabulated and discussed; the most remarkable finding is a predominance of feeds on wart hog and bush pig, although from spoor records Suidae formed only about 10 per cent. of the ungulate mammals in the area. A high proportion of feeds were also found to be on Bovidae including buffalo, roan antelope, reedbuck and duiker, but not bushbuck, hartebeest or waterbuck; and zebra appear not to be fed upon. Pigs were found to be about 13 times more liked, or more available than Bovidae. *D. M. Minter*

Ranque, J., Depieds, R. & Philipon, J. M. Réagines et immobilisines antitréponémiques sont-elles élaborées au cours des trypanosomiases spontanées ou expérimentales. [**Are Reagins and Treponemal Immobilizing Antibodies elaborated in Trypanosomiasis Spontaneous or Experimental?**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 329–32.

In 32 cases of sleeping sickness 8 sera were positive with the Kolmer, Wassermann, Kahn, Kline and TPI tests; 29 sera were negative with all reactions; 3 gave results which disagreed and of these 1 was negative with TPI but positive with the others; 1 was doubtful with Kolmer and Kline and negative with Kahn and TPI; 1 was weakly positive with Kolmer and negative with the others.

In artificial (therapeutic) trypanosomiasis (*Trypanosoma gambiense*) in 7 patients 1 gave a temporarily positive Wassermann reaction in the cerebrospinal fluid in the second month; all were TPI negative.

Of 35 guineapigs infected with *T. gambiense* none showed any TPI reaction; 2 were temporarily positive with Kahn, Kline and Wassermann reactions; 24 infected with *T. brucei* were all TPI negative; of 34 white rats and 36 guineapigs infected with *T. equiperdum* only 4 showed some reagin, with serum reactions disagreeing.

It is concluded that trypanosomiasis does not result in positive TPI reactions and these may be useful in uncovering false positive classical reactions for syphilis; these latter are rare (3 per cent.) and often doubtful and transitory. When the classical reactions are repeatedly and definitely positive the diagnosis of a concomitant syphilis is justified, but even the TPI test cannot differentiate between the various treponematoses.

T. E. Osmond

Launoy, L. Chez la rate, en période d'allaitement, la glande mammaire est-elle voie d'excrétion pour le diméthanesulfonate du diamidinodiphénoxypentane? [**Is Lomidine excreted in the Milk of Rats?**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 4, 476–82. [11 refs.]

Studies on the estimation, excretion and retention of diamidines have been reported in this *Bulletin* since 1942. The urine and bile appear to be the principal channels of excretion and nearly all other organs and

tissues retain the drugs in some degree, for long periods. Excretion or storage in the mammary gland does not appear to have been investigated. The author has therefore followed the course of infection with *Trypanosoma gambiense* in 20 rats suckled by mothers receiving large doses of lomidine (the dimethanesulphonate of diamidinodiphenoxy pentane) either *per os* or intramuscularly at various intervals and dosage after parturition. Suitable controls, in which the mother received no drug treatment, were also used in order to follow the normal course of infection in suckling rats. Other sucklings whose mother was untreated were given minute doses of the drug by mouth in order to confirm its prophylactic effect. Those young rats whose mothers received drug by either of the two routes and which were inoculated with infected blood at ages of 19 to 34 days were not protected and died. Those receiving small doses of drug directly by mouth were protected. It was concluded that under the conditions employed the mammary gland of the rat does not excrete sufficient lomidine to protect the suckling from infection with *T. gambiense*. *J. D. Fulton*

Fulton, J. D. & Grant, P. T. **The Preparation of a Strain of *Trypanosoma rhodesiense* resistant to Stilbamidine and some Observations on its Nature.** *Exper. Parasit.* New York. 1955, July, v. 4, No. 4, 377–86, 2 pls. [17 refs.]

When an infection of *T. rhodesiense* in laboratory animals is treated with stilbamidine (4:4′-diamidino stilbene) certain structures in the trypanosomes take up this fluorescent substance within a short period and show brilliant illumination in ultraviolet light [this *Bulletin*, 1942, v. 39, 238]. This property was made use of as an aid to study the phenomenon of drug resistance. By its means the uptake and localization of the drug on normal and stilbamidine-resistant strain of the parasite were studied. The drug-resistant strain was prepared by giving increasing subcurative doses of drug to infected mice followed by passage into other mice accompanied by similar treatment. A total of approximately 70 passages was made over 14 months to obtain maximal resistance, which remained stable over a period of 1 year in untreated animals then declined rapidly. The treated strain proved resistant to a wide range of chemical substances besides stilbamidine.

After exposure to drug *in vivo*, the trypanosomes were isolated and, by means of fluorescent methods, the amount of drug absorbed by an equal weight of normal and resistant strains determined after complete extraction from the parasites. Similar experiments were made by exposing the trypanosomes to the drug *in vitro*. It was found that both strains of parasite absorbed the drug, but significantly more was taken up by the normal strain. This is also well illustrated by photographs taken under ultraviolet illumination. The effect of diamidines on respiration of the two

strains of parasite was similar over short-term experiments, in agreement with the fact that the drugs are somewhat slow in action *in vivo*.

J. D. Fulton

Trincão, C., Nogueira, A. & Franco, A. **Puromycin Studies in Experimental** *Trypanosoma gambiense* **and** *Trypanosoma rhodesiense* **Infections in Mice.** *Antibiotics & Chemotherapy.* New York. 1955, Sept., v. 5, No. 9, 505–7.

This paper briefly relates the results of 8 experiments in which Puromycin was administered intraperitoneally in mice inoculated with *T. gambiense* and *T. rhodesiense*. A dose of 30–60 mgm./kgm. daily for 10 to 12 days from the day of inoculation was curative. Treatment delayed for 5 days or more was only temporarily suppressive, and 1 or 2 large doses 1 day before or after inoculation were also ineffective. [See also this *Bulletin*, 1955, v. 52, 134.] *L. P. Garrod*

Hawking, F. & Thurston, June P. **The Action of Antrycide upon Trypanosomes** *in vitro*. *Brit. J. Pharmacol. & Chemotherapy.* 1955, Dec., v. 10, No. 4, 454–5.

"1. When trypanosomes (*T. equiperdum*) were exposed to antrycide methylsulphate *in vitro* at 35°C. for 20 hr., the minimum trypanocidal concentration of the drug was 10^{-6} to $2{\cdot}5 \times 10^{-7}$ for a normal strain, and only four times greater than this for an antrycide-resistant strain, which resisted the maximum tolerated dose *in vivo*.

"2. The power of normal trypanosomes to infect mice was destroyed by *in vitro* exposure to antrycide 10^{-6} for 5 hr. at 35°C., but that of antrycide-resistant trypanosomes was hardly affected by 4×10^{-6}.

"3. Judging by these results, the power of antrycide *in vitro* to destroy infectivity is probably more significant for its therapeutic action *in vivo* than is its direct trypanocidal action *in vitro*."

Werner, H. Beobachtungen über den Einfluss von Trypanosomen-Infektionen auf die Embryonalent-wicklung von weissen Mäusen und Goldhamstern. [**Observations on the Influence of Trypanosome Infections on the Embryonic Development of Mice and Hamsters**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, June, v. 6, No. 2, 150–58, 2 figs.

In order to verify the conflicting literary data on the effect of trypanosomiasis in pregnant females upon their offspring, the author studied this problem in experimental infections of mice and hamsters, using only females whose normal fertility had been established in previous matings.

These animals were inoculated with trypanosomes (*Trypanosoma equiperdum*, *T. gambiense*, *T. congolense* or *T. cruzi*) shortly before or after mating, or during pregnancy, and the results were assessed by examination of new-born litters and the embryos of infected females sacrificed at various periods of pregnancy.

The examination of normal control female rodents showed that all the embryos and offspring of the same litter were fully developed and of equal size. However, in infected females the effect upon the offspring varied according to the course of the disease: when it was chronic, pregnant mice infected with *T. congolense* or *T. cruzi*, and hamsters infected with *T. equiperdum* or *T. congolense*, produced foetuses and litters among which a high proportion were under-developed, as shown by their small size; however, when the infection ran an acute course, it had no visible effect upon the embryonic development of the offspring of mice infected with *T. equiperdum* or *T. gambiense* or upon those of hamsters infected with *T. gambiense*. The appearance of the foetuses from normal and infected mothers is depicted in a series of photographs.

In discussing the factors responsible for the retarded development of the offspring of infected mothers, the author considers deficient nutrition and toxic effects. Since he has also demonstrated that female rats infected with the non-pathogenic *T. lewisi* produced a normal litter, the first supposition seems to be improbable. As regards the second supposition, in a previous paper [this *Bulletin*, 1955, v. 52, 879] the author has shown that toxins produced by trypanosomes were not transmitted to the foetus, hence it is concluded that the toxins cause direct harm to the mother, while the development of the embryos is indirectly affected by their mother's condition. It is admitted, however, that the whole problem is in need of further investigation. *C. A. Hoare*

Quay, W. B. **Trypanosomiasis in the Collared Lemming, *Dicrostonyx torquatus* (Rodentia).** *J. Parasitology.* 1955, Dec., v. 41, No. 6, 562–5. [10 refs.]

Hedrick, R. M. **A Trypanosome from the Big Brown Bat, *Eptesicus fuscus fuscus* (Beauvois), in Minnesota.** *J. Parasitology.* 1955, Dec., v. 41, No. 6, 629–34, 1 fig. [12 refs.]

Buttner, Alice & Bourcart, Nicole. Sur certaines particularités biologiques d'un trypanosome de la grenouille verte *Trypanosoma inopinatum* Sergent, 1904. [**Some Biological Features of a Trypanosome of the Green Frog, *Trypanosoma inopinatum***] *Ann. Parasit. Humaine et Comparée.* 1955, v. 30, Nos. 5/6, 431–45, 5 figs. [27 refs.]

Woody, N. C. & Woody, Hannah B. **American Trypanosomiasis (Chagas' Disease). First Indigenous Case in the United States.** *J. Amer. Med. Ass.* 1955, Oct. 15, v. 159, No. 7, 676–7, 1 fig.

Trypanosoma cruzi infections have been reported in animals and arthropods in various parts of North and of South America. Naturally-infected triatomids have been found in California, Arizona and Texas [this *Bulletin*, 1940, v. 37, 142; 1942, v. 39, 244, 445; 1943, v. 40, 590]. In the latter State, armadillos, opossums, mice and woodrats have been found naturally infected; but the infection has not hitherto been recognized in man in the United States.

A female child was born in October 1954, in Texas, of white parents who had not been out of the U.S.A. Their home abutted on overgrown brush country in which there are many opossums. Triatomid bugs were numerous and troubled the family when biting at night; the father was repeatedly bitten, but no bites were actually noticed on the child. In July 1955 the child became listless, irritable and feverish, but not very ill. There were no clear physical signs, but there was a lymphocytosis (78 per cent.). Three days later there was a fine macular rash on the extremities and trunk; a diagnosis of possible infective mononucleosis was made and tetracycline was prescribed.

The child was brought back a week later with continuing slight fever, some puffiness of the eyelids, and an enlarged post-auricular gland. The lymphocytosis had increased to 82 per cent. of 35,300 leucocytes per cmm. A diagnosis of leukaemia was considered, but in the course of examinations of the cellular detail numerous *Trypanosoma cruzi* were seen and recognized in blood films. There are excellent photomicrographs of these in the text. Tetracycline treatment was resumed, as Achromycin was reported by Porter *et al.* (*Antibiotics & Chemotherapy*, 1952, v. 2, 409) to have trypanocidal properties; the child became afebrile within 48 hours, the liver and spleen enlargement went, the gland swelling subsided and there were no neurological or cardiac abnormalities. Nevertheless trypanosomes persisted in the peripheral blood.

This case shows that strains of *T. cruzi* in the reduviid bug and animal hosts in the vicinity of Corpus Christi, Texas, are infective to man, and that acute Chagas's disease can occur there in young children.

[What is also of much importance to the profession is that this paper reveals the fundamental errors that may so easily arise from the vexatious confusion in the multifarious nomenclature of drugs, particularly when it is repetitive. As already pointed out by the abstracter (this *Bulletin*, 1955, v. 52, 616) the " Achromycin " of Porter *et al.* (1952) referred to by the authors is not tetracycline (now commercially available as Achromycin), but in fact was Stylomycin (also known initially as " Achromycin ", but later Puromycin, and at the moment Stylomycin)—an antibiotic not related to the tetracycline group of antibiotics. This may in part account for the persistence of the parasites in the case

recorded above, in spite of the apparent clinical improvement after treatment with tetracycline.] *A. R. D. Adams*

Espinoza, L. Epidemiologia de la enfermedad de Chagas en la república del Ecuador. [**Epidemiology of Chagas's Disease in Ecuador**] *Rev. Ecuatoriana de Hig. y Med. Trop.* Guayaquil. 1955, Jan.–Mar., v. 12, No. 1, 25–105, 18 figs., 6 maps, 2 charts & 1 plan. [40 refs.]

This represents a thesis approved for the degree of Doctor of Medicine and Surgery in the University of Guayaquil. Accordingly, much of the early part is introductory in nature, and recapitulates previous work on Chagas's disease, including the history of the disease in Ecuador. Brief mention is made of methods of transmission other than by the usual contaminative infection, and the first section of the paper is devoted to an account of the Triatominae of Ecuador as vectors of *Trypanosoma cruzi*. This account includes, for each species encountered and for *Rhodnius prolixus*, a systematic description, a photograph of the species in the text, notes on ecology and biology, geographical and regional distribution, and records of infection with *T. cruzi*; the author's observations, inserted in tabular and map form for each of the 4 principal species encountered, comprise numbers of larvae, nymphs and adults of the species concerned, obtained from various localities, and their indices of infection. In all, 10 species and 1 subspecies (*Triatoma dimidiata capitata*) of Triatominae have been recorded from Ecuador, comprising the genera *Triatoma* (4 species and 1 subspecies), *Panstrongylus* (3 species), *Rhodnius* (2 species) and *Eratyrus* (1 species). Of these, 5 species were encountered by the author, namely *T. dimidiata*, *T. carrioni*, *P. chinai*, *P. rufotuberculatus* and *E. cuspidatus*. The last named is recorded for the first time from Ecuador. Natural infections with *T. cruzi* have previously been recorded for *T. dimidiata*, *T. carrioni* and *P. rufotuberculatus*; experimental infection has been demonstrated in *P. chinai*. The only species here found naturally infected with *T. cruzi* was *T. dimidiata*, which had infection indices in various localities of up to 62 per cent. (the highest figure recorded), and was consistently infected above 10 per cent. (except in 3 cases where numbers of specimens were very small). *T. dimidiata* was found to be exclusively urban in distribution, and *T. carrioni*, *P. chinai* and *P. rufotuberculatus* exclusively rural.

The second part of the paper, which deals with the first 185 registered cases of Chagas's disease in Ecuador, is preceded by a short account of the geographical, physiographical, economic and administrative aspects of the country, and an attempt is later made to relate these and other epidemiological features to the recorded incidence of the disease. Almost all the cases for which data were available were of the acute oedematous clinical type, and the great majority occurred in persons from coastal urban areas. Of 180 known [or assumed?] acute cases, 178 occurred in

the province of Guayas, of which 167 were within the city of Guayaquil. [In view of the author's observations on the distribution of *T. dimidiata*, the only habitual vector, this is a significant feature.] Correlation with other epidemiological factors includes the type of human dwellings inhabited by the urban populace, among which wooden houses greatly predominate, and seasonal climatic conditions; of 118 acute cases with data, 66 were recorded during drought or in summer, and 52 during wet periods or in winter. An analysis of acute cases by calendar months shows an all-the-year-round incidence, with increased numbers between April and July inclusive, and a peak in June (this is shown graphically). Chronologically, between the years 1929 and 1954, relatively high numbers of cases occurred during 1941 (12 cases), 1948 (30 cases), 1950 (28 cases), 1951 (14 cases), 1952 (19 cases) and 1953 (19 cases). [These high numbers in recent years may, however, be due to a number of causes other than epidemiological factors.] The number of cases occurring with increasing age-groups of individuals shows a concentration between 2 and 11 years of age, with a secondary peak at 23 to 24 years; no explanation is advanced for the latter. A segregation by sex gives 56 cases in males, and 53 in females; the clinical type of cases with available data was acute oedematous in 125, and acute without oedema in 18.

The distribution of the disease in Ecuador was investigated by direct examination of large drops of fresh blood, and by the Guerreiro-Machado complement-fixation reaction, in each of 3 human population types. The first of these comprised the students of 29 schools, the blood of whom gave one positive result in 1,125 (about 0·1 per cent.) by direct examination; complement-fixation was positive in 11 persons, negative in 443 (an infection rate of approximately 2·5 per cent.) and anticomplementary in 262. [These results are tabulated for individual schools, where the total of blood drops examined directly is incorrectly added as 1,123; and in a summary beneath, where the total is stated as 1,129.] The second population type investigated was from rural areas infested by triatomids (*T. carrioni*, *P. chinai* and *P. rufotuberculatus*); by direct examination of blood from many localities in 6 provinces, the infection rates were zero, except for values of 1·2 per cent. in children and 1·3 per cent. in adults, both from the province of Guayas; the Guerreiro-Machado reaction gave positive infection rates in 4 out of 5 provinces, the highest being 24 per cent. from Guayas. Thirdly, investigation was made among hospital patients, data on blood films being obtained from 11 urban institutions in 5 provinces; the only positive results were again from Guayas, with values of 1·5, 2·6 and 4 per cent. respectively for 3 hospitals; complement-fixation for the same 3, and another hospital, revealed infection rates of 10, 10, 10 and 11 per cent., respectively. Maps are given to show the distribution of the disease as determined parasitologically, and as indicated by positive complement-fixation reactions.

The final section of the paper is concerned, less exhaustively, with the

reservoir animals concerned in Chagas's disease in Ecuador. An investigation included *Didelphys azarae* and *D. paraguayensis*, rats, dogs, cats, armadillos, bats and sloths. Of these, positive results were obtained in 1 of 203 rats (0·5 per cent. infection), based upon the finding of leishmaniform bodies in the cardiac muscle, and in a total of 36 out of 86 *Didelphys* spp. (41 per cent. infection). A detailed study was made of the 86 *Didelphys* spp., derived from many localities in the province of Guayas, by means of direct examination of the fresh blood, complement-fixation, histopathological examination, subinoculation into white rats and haemoculture. Incidental to the investigation was the observation of heavy infections of an unidentified nematode in the blood of the bats examined.

[This is a thorough and apparently reliable document, but occasionally confusing in its presentation. The tables are generally good, the maps adequate, and some photographs and parts of the text superfluous. A number of trivial errors occur, largely through incompatibility of parallel printers' symbols in the text which relate to footnotes; there is also some inconsistency in the representation of percentages in the results to comparable degrees of accuracy.] *N. R. Phillips*

Lôbo, A. G. S., Borba, A. M. & de Souza, J. Contribuição ao conhecimento da distribuição geográfica dos triatomíneos domiciliários e seus índices de infecção natural pelo *S. cruzi* no Estado do Paraná. [**Geographical Distribution of Domestic Triatomids and Their Natural Infection Indices with** *T. cruzi* **in the State of Paraná, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Oct., v. 6, No. 4, 571–87, 2 maps.

This paper consists largely of an up-to-date (October 1953) list of localities, grouped by municipalities, in which *Triatoma infestans* occurs, or has been shown by investigation to be (apparently) absent; and of those localities in which *T. infestans* naturally infected with *Trypanosoma cruzi* has been encountered. It represents a considerable extension of previous records for the State of Paraná, a summary of which prefaces the authors' results. Prior to the observations made in this paper, *Triatominae* (*T. infestans*, *Panstrongylus megistus* and *T. sordida*) had been recorded from 25 localities, in 17 municipalities; the present work shows the occurrence of *T. infestans* in 678 localities, distributed among 19 municipalities, out of a total of 875 localities in 23 municipalities investigated. In all, 9,129 specimens (4,191 adults and 4,918 nymphs) of *T. infestans* were collected; "larvae" were also taken, but were not included in the results.

Infected specimens of *T. infestans* were encountered in 234 localities, among 16 municipalities. Of 7,700 examined (3,859 adults, 3,841 nymphs), 1,452 (1,038 adults, 414 nymphs) were positive for *T. cruzi*;

this is a natural infection index of 18·86 per cent. (26·90 per cent. for adults, 10·78 per cent. for nymphs). The numbers of *T. infestans* collected, examined, infected and their indices of infection are tabulated by municipalities; the distribution of *T. infestans*, and of *T. infestans* of various percentage infection indices, are given in maps. [The recorded distributions all occur in a relatively small area along the north and east boundaries of the State, adjoining the State of São Paulo; it should be noted that investigations were confined to the northern region of Paraná, and are not representative of the State as a whole.] *N. R. Phillips*

Dias, E. Índices de infecção dos transmissores da doença de Chagas no Município de Bambuí, Minas Gerais. [**Indices of Infection of Vectors of Chagas's Disease in Bambui, Minas Gerais, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Oct., v. 6, No. 4, 607–10, 1 map.

Indices of relative occurrence and infection with *Trypanosoma cruzi* are detailed for the only two triatomid vectors of Chagas's disease encountered by the author, between November 1943 and December 1951, from the area of the city of Bambuí, in the State of Minas Gerais.

Of a total of 142,659 Triatominae captured, 134,236 (94·1 per cent.) were *Triatoma infestans*, and 8,423 (5·9 per cent.) were *Panstrongylus megistus*. The ratios of abundance of various stadial groupings ("larvae": nymphs: adults) were 64,365: 31,941: 37,930 for *T. infestans*, and 2,949: 2,097: 3,377 for *P. megistus*.

The total index of infection with *T. cruzi* for *T. infestans* was 23·9 per cent. (1,678 positive of 7,025 examined); this comprised 31·5 per cent. (1,445 of 4,583) for adults, 10·8 per cent. (170 of 1,569) for nymphs, and 7·2 per cent. (63 of 873) for "larvae". For *P. megistus* the total index was 25·9 per cent. (281 of 1,085), comprising 30·1 per cent. (202 of 671) for adults, 22·7 per cent. (71 of 313) for nymphs, and 7·9 per cent. (8 of 101) for "larvae". Infection indices in *T. infestans* were not significantly different in areas of dense and sparse human population. In *P. megistus*, however, indices were twice as high, or more, in rural compared with urban areas, for all stadial categories; suburban areas occupied an intermediate position, but approximated to rural values. The distributions of infected and non-infected vectors are tabulated by urban, suburban and rural areas, and shown in map form, for each species.

In one suburban area of Bambuí, 87·6 per cent. of 355 dwellings were infested with Triatominae; of 311 dwellings, both vector species occurred in 186 (59·8 per cent.), 111 (35·7 per cent.) harboured only *T. infestans* and 14 (4·5 per cent.) only *P. megistus*. Of the houses infested with *T. infestans* or *P. megistus*, 193 (62·1 per cent.) contained infected vectors. During the period of observation quoted, most infested dwellings

yielded less than 50 triatomids; 102 each produced between 50 and 500, and 27 each yielded more than 500. From 3 houses, which showed the greatest degree of infestation, a total of 6,903 triatomids (3,087; 2,170; 1,646 respectively) were collected. *N. R. Phillips*

Citri, N. & Grossowicz, N. **A Liquid Medium for the Cultivation of** *Trypanosoma cruzi*. *Nature*. 1954, June 5, v. 173, 1100–101.

The authors describe a new liquid medium for the cultivation of *Trypanosoma cruzi*, of simple composition, which may facilitate a quantitative analysis of the growth requirements of the haemoflagellates. Its composition is as follows:

I. Salts:	NaCl	0·4 per cent.
	$Na_2HPO_4.12H_2O$	0·3 ,, ,,
	KH_2PO_4	0·05 ,, ,,
II.	Casein hydrolysate	1·0 ,, ,,
III.	Haematin	10 μgm./ml.
	Bovine albumin (fraction V)	0·5 mgm./ml.
	Tomato juice	3·0 per cent.

I and II are dissolved in distilled water (*p*H 7·8) and autoclaved, after which Seitz-sterilized III are added to the mixture, and the medium is poured in 5 ml. quantities into test-tubes. After inoculation of the trypanosomes the culture is incubated at 28°C. in a slanted position. In addition to *T. cruzi*, *Leishmania tropica* (and probably other species) grow readily in this medium. *C. A. Hoare*

Agosin, M. & von Brand, T. **Characterization and Intracellular Distribution of the Succinic Dehydrogenase of** *Trypanosoma cruzi*. *Exper. Parasit.* New York. 1955, Nov., v. 4, No. 6, 548–63, 4 figs. [30 refs.]

" 1. Homogenates and cellular fractions of *T. cruzi* prepared in isotonic sucrose showed succinic dehydrogenase activity as measured by the oxygen uptake in the presence of various artificial electron carriers.

" 2. Conditions for maximum dehydrogenase activity have been determined (temperature, electron carriers, *p*H, phosphate concentration, activators, and substrate concentration).

" 3. Intracellular distribution studies show that most of the dehydrogenase activity is particle bound.

" 4. The SH dependence of the enzyme is shown by its response to iodoacetamide. It produces an inhibition proportional to its concentration.

" 5. A very powerful malonate inhibition of succinic dehydrogenase of

homogenates and mitochondrial fraction of *T. cruzi* seems to be of a non-competitive type and appears to be not related to inactivation of SH groups or to the inhibition of oxalacetate oxidation.

" 6. The succinic dehydrogenase activity of *T. cruzi* is clearly inhibited by added DPN and stimulated by the addition of calcium ions.

" 7. Cytochrome-c, a component of the succinoxidase system of most organisms, is not effective as electron carrier in *T. cruzi.*"

Goodchild, A. J. P. **The Bacteria associated with** *Triatoma infestans* **and some other Species of Reduviidae.** *Parasitology.* 1955, Nov., v. 45, Nos. 3/4, 441–8.

A study of bacteria inhabiting the gut of several reduviid species was made by means of (1) stained smears of midgut contents, (2) serial sections of midgut tissue, (3) blood-agar slope cultures of gut contents. The first of these methods was less satisfactory than the others, and the last produced the most reliable results.

It is well authenticated that only a single bacterial symbiont, *Actinomyces rhodnii*, occurs in the gut of *Rhodnius prolixus*: this bacterium has a mild antibiotic inhibiting effect upon other bacteria.

In *Triatoma infestans*, pure cultures of *A. rhodnii* were obtained in a few instances, but the majority of specimens yielded a mixture of micro-organisms, 4 types of which were sufficiently abundant to be considered of symbiotic significance. Three of the 4 types were Gram-positive, gave vigorous plate cultures, and were taken to have been dense in the culture inocula; the fourth (identified as resembling *Bacterium alkaligenes*) was Gram-negative, produced a weak culture, and was probably derived from sparser density inocula. The most abundant type consisted of rod-like diphtheroid organisms resembling *Corynebacterium hofmannii*, and occurred extensively within vacuoles in the midgut endothelium (in contrast to *A. rhodnii*, which is found only in the lumen of the intestine). Of the remaining two types, one appeared similar to *Streptomyces* sp., and the other resembled *Staphylococcus albus* or *Micrococcus* sp. It appears, therefore, that although symbiosis in *T. infestans* is a closer relationship as judged by the diphtheroid type of bacterium, it is less specialized in not being a single species association of the kind existing in *Rhodnius*. It is suggested that the combined presence of several bacterial types may be due to a weaker antibiotic effect (as compared with *A. rhodnii*) on the part of the *Corynebacterium*-like organisms, or to a masking of the antibiotic activities by virtue of its localization in vacuoles. Organisms similar to those of *T. infestans* were cultured from *T. protracta*.

Attempts to inoculate *R. prolixus* with pure cultures of the *Corynebacterium*-like organisms of *T. infestans* were unsuccessful; when inoculated together with *A. rhodnii*, only the latter became established.

Examination of two predatory reduviids, *Sinea diadema* and *Coranus subapterus*, produced cultures of micro-organisms only with material derived from the rectum of the insects. This is probably correlated with the presence of powerful proteolytic enzymes in the anterior midgut, which might consequently be an unfavourable situation for bacterial symbionts. *N. R. Phillips*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

Rathnaswamy, G. K. & Ramakrishnan, N. R. **Report on a Sandfly Survey of Madras City.** *Indian J. Ent.* 1954, v. 16, Pt. 1, 29–36, 1 map. [11 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Dec., v. 43, Pt. 12, 196–7.]

Visceral leishmaniasis (kala-azar) has long been prevalent in Madras City and there is evidence that it has increased during the past 20 years. It occurs throughout the year with no marked seasonal peak, but is almost confined to older and more crowded parts of the city, which form a single endemic area.

Seven species of *Phlebotomus* were collected in the city during 1951–53, of which six were obtained during a systematic survey carried out from November 1951 to October 1952. They included *P. papatasi* (Scop.) and *P. argentipes* Ann. & Brun. [which were the only members of the subgenus *Phlebotomus*] and these two made up 2,905 and 298 of the 5,020 sandflies collected in the survey, when 926 man-hours were expended in the examination of 6,565 structures. *P. argentipes*, the presumed vector of visceral leishmaniasis, was not evenly distributed; divisions in which it was plentiful and others in which it was not occurred both within and outside the endemic area. In general, the sandflies were most numerous in mud-walled and thatched dwellings and rested in cool, dark corners. Few were found in animal shelters. All species except *P. papatasi* were caught mostly within five ft. of the ground.

Dissection of 74 females of *P. argentipes*, 664 of *P. papatasi* and 131 of other species failed to reveal any leptomonad forms. Rhabdidiform larvae were occasionally found in *P. argentipes* and *P. papatasi* and larvae of *Mermis* in blood from the abdomen of one female of *P. papatasi*, while microfilariae of *Wuchereria bancrofti* were observed frequently in the females of *P. papatasi* that had been collected in two divisions of the city in which this filaria is endemic and is transmitted by *Culex pipiens fatigans* Wied. Various mites were found attached to the sandflies.

Coutinho, J. O. Observações sôbre a vacinação preventiva com leptomonas mortas na leishmaniose espontânea da cobaia: *Leishmania enriettii*. [**Preventive Vaccination with Dead Leptomonads against Leishmaniasis of Guineapigs due to** *Leishmania enriettii*] *Folia Clin. et Biol.* S. Paulo. 1954, May, v. 21, No. 5, 321–6. [11 refs.]

After a short review of previous work on vaccination against various forms of human leishmaniasis with living and dead flagellates, the author describes the results of his own experiments on the protective action of vaccination upon cutaneous leishmaniasis of guineapigs produced by *Leishmania enriettii*.

The vaccines were prepared from NNN cultures of *L. enriettii*, *L. braziliensis* and *L. donovani*, which were killed by heat and suspended in saline with 0·4 per cent. phenol, in dilutions corresponding to about 100 million flagellates per cc. Each animal was vaccinated (subcutaneously, intramuscularly or intradermally) with 3–4 doses of 0·5 cc. at intervals of one week. Thirty days after the last vaccination the guineapigs were inoculated with *L. enriettii* recovered from fresh ulcers, and the same material was used to check the virulence of the strain in non-vaccinated control animals.

The results of these experiments were as follows. In the group of 14 guineapigs vaccinated with *L. enriettii*, all the animals became infected; about half of them died after the usual interval of time, but the other half recovered spontaneously, and this was the only evidence of protection afforded by the vaccination. In the group vaccinated with *L. braziliensis*, out of 14 animals 11 became infected but 3 were refractory to the first inoculation of *L. enriettii*, though a slight infection was produced after a second inoculation: there was thus evidence of cross-immunity between the two species of parasites. In the last group, vaccination with *L. donovani* afforded no protection against infection with *L. enriettii*. *C. A. Hoare*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

Kryński, S. & Becla, E. **Influence of Milk on Viability and Infectivity of** *R. prowazeki*. *Bull. State Inst. Marine & Trop. Med., Gdańsk, Poland.* 1955, v. 6, 205–9. [Also fuller version in Polish 193–200, 4 charts. (15 refs.) & Russian 200–205.]

The authors have investigated the suitability of milk diluted with an equal volume of water as a medium for suspending and preserving *Rickettsia prowazeki*. An infected louse gut was ground in 1 cc. of the

medium and dilutions up to 10^7 were titrated in lice; titration with diluted milk as diluent gave a titre about 1 log. unit higher than a comparable titration in which *p*H 7 sodium phosphate buffer was used. A suspension in buffer was no longer infectious after storage at 4°C. for 5 days, whereas the infectivity of a suspension of rickettsiae in diluted milk was not lost until 35 days. At 34°C. infectivity was lost after 2–7 hours in buffer, but was preserved up to 72 hours in diluted milk. *D. J. Bauer*

Zhmaeva, Z. M., Pchelkina, A. A., Mishchenko, N. K. & Karulin, B. E. [**The Epidemiological Importance of Ectoparasites of Birds in a Natural Focus of Q Fever in the South of Central Asia**] *Dokl. Akad. Nauk SSSR.* Moscow. 1955, v. 101, No. 2, 387–9. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Dec., v. 43, Pt. 12, 185–6.]

Investigations on possible vectors and reservoirs of a disease, subsequently identified as Q fever, that occurred among people in the south of Soviet Central Asia in 1953 led to the discovery that *Coxiella* (*Rickettsia*) *burneti* was present in various parts of the southern desert in the rodents, *Rhombomys opimus* and *Spermophilopsis leptodactylus*, and the field sparrow, *Passer montanus pallidus*, and also in *Hyalomma excavatum* Koch, *H. detritum* Schulze, *Argas reflexus* (F.), Laelaptid (Dermanyssid) mites and *Leeuwenhoekia major* Shluger. Moreover *H. asiaticum* Schulze & Schlottke, *H. marginatum* Koch (*plumbeum*, auct.) and *Rhipicephalus turanicus* Pom. readily transmitted it from infected to healthy guineapigs and preserved it through all stages of their development, including the egg, and *H. marginatum* also transmitted it to chickens, which sickened and died.

Investigations on the field sparrow and its parasites were carried out in a village in the valley of the Kashka-Dar'ya (south-western Uzbekistan), where it was very numerous, nesting under the roofs of the houses and in cracks in the walls, and also in holes in the loess ravines near the village. The ectoparasites found in greatest numbers in the nests were *A. reflexus* and the mites, *Dermanyssus passerinus* Berl. & Trt. and *Steatonyssus viator* (Hirst). Injections of suspensions into the abdomens of guineapigs resulted in the isolation of one strain of *C. burneti* from the brains of sparrow nestlings and others from a pool of examples of the two species of mites taken from nests in ravines and from examples of *A. reflexus*, including one lot of nymphs that had engorged in the nests but had then been kept for seven months in the laboratory, where they dried up. All these strains behaved similarly in guineapigs or white rats, and produced similar pathological changes in guineapigs. Guineapigs that had recovered from infection with the strain obtained from the mites were immune from infection with strains isolated from Q fever patients, and *vice versa*.

It is considered probable that *D. passerinus*, *S. viator* and *A. reflexus*,

which are widely distributed in the region, are all of importance in the maintenance of the rickettsiae and the infection of birds, and that the two mites, both of which are known to attack man, may also be concerned in human infection.

Zemskaya, A. A. & Pchelkina, A. A. [**Experimental Infection of the Bird Mite** *Dermanyssus gallinae* **Redi and the Rat Mite** *Bdellonyssus bacoti* **Hirst with the Causal Agent of Q Fever**] *Dokl. Akad. Nauk SSSR.* Moscow. 1955, v. 101, No. 2, 391–2. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Dec., v. 43, Pt. 12, 186.]

In view of the isolation of *Coxiella* (*Rickettsia*) *burneti* from sparrow mites [see preceding abstract], experiments on its transmission by *Dermanyssus gallinae* (Deg.) and *Bdellonyssus bacoti* (Hirst) were carried out. Both species acquired the infection from guineapigs on which they fed during the period of fever and infected healthy guineapigs on which they fed 10–15 days later. *D. gallinae* also infected chickens and was able to infect two birds in succession, or a bird and a guineapig. Transmission was obtained in one instance from the bite of a single female of *B. bacoti*, and infected females of this species and *D. gallinae* were still able to transmit after having been fed ten and seven times, respectively, on healthy animals. It was also shown that infected females that fed on healthy animals preserved the rickettsiae for up to six months, and a suspension prepared from 19 dead examples of *B. bacoti* that had been kept for 75 days in a closed test-tube proved infective to a guineapig.

RABIES

Pellissier, A. Considérations sur la rage en A. O. F. (A propos de 82 cas dont 4 humains.) [**Observations on Rabies in French West Africa (with respect to 82 Cases, including 4 in Man)**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 4, 458–63. [25 refs.]

Although written under the above title, this article deals with rabies in French Equatorial Africa (A.E.F.), where proof of the existence of that disease was first established in 1932 [this *Bulletin*, 1933, v. 30, 576] by the isolation of the causal virus from a rabid dog and where since that time the disease has continued to occur, mostly in endemic form, throughout the Federation. Thus 82 of the specimens of brain tissue sent from various parts of the territory between 1947 and 1953 to the Pasteur Institute at Brazzaville proved, on laboratory investigation, to be positive for rabies. Of these positive brains 67 derived from dogs,

8 from cats, 4 from human beings, 2 from jackals and one from a cheetah. In this connexion certain results obtained from histopathological examination and from biological diagnostic tests are of particular interest.

In sections treated with Mann's stain the Negri bodies did not assume the characteristic vermilion red colour, but appeared as bluish-pink or frankly blue formations—a finding regarded as typical in infections with African strains of rabies virus.

Biological tests showed that, while in general the strains recovered from the brain-tissue specimens were of average virulence, one isolated from a cat was of very low virulence (*souche de virus atténué*) and one from a dog was of exalted virulence (*souche de virus renforcé*). In one instance there was a very exceptional finding: in the case of a European male aged 41 years the cerebrospinal fluid was shown to be virulent by causing, on its intracerebral inoculation into rabbits, subsequent meningo-encephalitis and Negri-body formation.

Finally, among the brain specimens in which rabies virus was demonstrated by animal inoculation, there were 3 atypical histopathological findings. In the brain of the above-mentioned European male Negri bodies were present, but no signs of meningo-encephalitis. In the brain of the cat, from which the attenuated strain of virus was isolated, there was well-marked meningo-encephalitis, but no Negri-body formation. In the brain of the dog, from which the exalted virus was recovered, there was no evidence of meningo-encephalitis or of Negri-body formation; in this case it is of interest to note that, after the intracerebral inoculation of guineapigs and rabbits with brain tissue from the dog, there developed in the former animals an intense meningo-encephalitis, accompanied by specific lesions of fixed-virus rabies in Ammon's horn, and in the latter animals a diffuse congestion of the brain and meninges, accompanied by Negri-body formation in Ammon's horn and by specific lesions of fixed-virus rabies. *G. Stuart*

Burns, K. F. & Farinacci, C. J. **Rabies in Nonsanguivorous Bats of Texas.** *J. Infect. Dis.* 1955, Sept.–Oct., v. 97, No. 2, 211–18, 1 fig. [16 refs.]

In the United States of America rabies in insectivorous bats was first discovered in 1953, when the infection was successively diagnosed in the yellow bat (*Dasypterus floridanus*) in Florida and in the hoary bat (*Lasiurus cinereus*) in Pennsylvania [this *Bulletin*, 1954, v. 51, 569, 686 *bis*].

The present article records the occurrence of rabies in yet another species of insectivorous bat in that country—this time in the Mexican free-tailed bat (*Tadarida mexicana*) of Texas in 1954. In Texas, bordered as it is by three Mexican States in which there exists in large numbers the vampire bat *Desmodus*, a proved transmitter of bat rabies to man

and to animals (including other bat species), a survey to study the possibilities of rabies infection among the huge bat population on the military reservation at Fort Sam Houston was carried out between February and June 1954. All of the Molossidae collected during that period were classified as *Tadarida mexicana*. The results of the survey may be summarized as follows:

In the cerebellum and Ammon's horn of 2 bats, one with spastic paralysis and the other with apparent encephalitis at the time of capture, typical Negri bodies were present. None of the remaining 70 bat brains revealed any type of inclusion body formation.

From the brains of the 2 bats shown to contain Negri bodies two strains of rabies virus were isolated and identified.

Serological investigations of 207 serum specimens taken from apparently normal healthy bats revealed the presence of neutralizing antibody for the virus of rabies in 65 per cent.—a finding which provides evidence of the bats' previous experience with the disease.

These results seem to indicate that in Texas, just as in Florida and in Pennsylvania, non-haematophagous bats may constitute a reservoir for the virus of rabies. In the meantime investigations are progressing to determine the true significance of these results in the epizootiology of the disease in the three States and its possible importance to the entire rabies problem.

[Rabies in fruit- and insect-eating, non-haematophagous bat species in Trinidad was discovered by Pawan in 1936 (see this *Bulletin*, 1936, v. 33, 742).] *G. Stuart*

Karparoff, A. Photographie électronique du virus fixe de la rage. [**Electron Microphotography of Fixed Rabies Virus**] *Ann. Inst. Pasteur.* 1955, Dec., v. 89, No. 6, 701–3, 1 fig.

Brains of rabbits infected with fixed-virus rabies were first exposed to the action of ether for 4 hours, in order to free the virus-containing brain tissue from fatty substances impervious to electrons. Thereafter these brains were placed for 20 hours in physiological salt solution—a medium in which diffusion of the virus readily occurs and one from which preparations for electron micrography can successfully be made.

Photomicrographs of these preparations showed what the author regarded as the rabies virus to be round or ovoid bodies, varying in size from 100 to 300 mμ. Subdural inoculation of rabbits and guineapigs with the material examined was followed by incubation periods and clinical symptoms typical of fixed-virus rabies in these animals. Photomicrographs of preparations made from normal rabbits' brains in the manner indicated above revealed none of the bodies considered to be rabies virus.

In commenting on these findings Lépine expressed the opinion that, while the microphotographs described by the author might indeed be photomicrographs of the rabies virus, proof of such identity was,

nevertheless, lacking. Such proof could not rest solely on a morphological description of one or more bodies made manifest by the electron microscope. Moreover, it had not been established that variations in the concentration of such bodies were accompanied by parallel variations in virulence, or that the material investigated possessed the same physical and chemical properties as those characteristic of rabies virus, *e.g.*, resistance [to cold, desiccation and glycerol; thermolability], etc. Further, inasmuch as the concentration of rabies virus in brain tissue rarely exceeds 10^4 or 10^5, diffusion of that virus in the medium used by the author must have resulted in its dilution to such a degree as to render the chances of its recognition by the electron microscope remote indeed. What the author photographed might well have been proteolipid material detached from brain tissue which had previously been treated with ether and thus rendered highly friable. *G. Stuart*

Baltazard, M. & Bahmanyar, M., with the collaboration of M. Ghodssi, A. Sabeti, C. Gajdusek & E. Rouzbehi. Essai pratique du sérum antirabique chez les mordus par loups enragés. [**Practical Trials of Anti-Rabies Serum in Persons bitten by Rabid Wolves**] *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 5, 747–72, 12 pls.

That anti-rabies vaccination had failed to prevent the development of rabies in a disturbingly high proportion of persons who had been bitten on the head by rabid wolves is proved by the experience of Iran, where between 1936 and 1949 the case fatality rate was 28 per cent. among 186 persons so exposed to risk and treated at the Pasteur Institute, Teheran, with de Silva-type (phenolized rabbit brain) or, after 1946, with Semple-type (phenolized sheep brain) vaccine [this *Bulletin*, 1954, v. 51, 576]. Moreover when this rate was calculated on the number of deaths which occurred among those cases where there was definite proof of rabies in the biting wolf, it reached 42 per cent.—a percentage comparable with that (45) given by Nikolic [this *Bulletin*, 1952, v. 49, 946] in his results of treatment in various countries, including Iran, of persons bitten on the head by rabid wolves. In an attempt to remedy this inadequacy of vaccine treatment the WHO Expert Committee on Rabies recommended in 1950 [this *Bulletin*, 1951, v. 48, 32] that, as soon as a suitable opportunity offered, a trial should be undertaken in Iran to determine the practical value of hyperimmune anti-rabies serum combined with vaccine in the treatment of cases so gravely at risk. The long-awaited opportunity presented itself in August 1954, when in and near the village of Sahané during the early hours of the morning of the 22nd, a rabid wolf in its attack on 29 persons bit 18 on the head—12 very seriously—and 11 on the trunk or limbs. Of those bitten 27 reached Teheran within 32 hours of the attack, which had lasted 4 hours until the wolf was killed by a peasant armed with a mattock.

For purposes of treatment the bitten persons were placed in 5 groups,

the nature and gravity of the wounding being strictly comparable in each of the 3 groups with head injuries. The vaccine used in treating all 5 groups was of the Semple-type (sheep's brain, 5 per cent.; phenol, 0·60 per cent.) and the prescribed dosage was 5 ml. daily on each of 21 successive days. The hyperimmune serum used in combination with the vaccine in treating 3 of the groups was rabbit serum prepared by the Lederle Laboratories; it was injected intramuscularly, deep into the buttock, in a dosage of 0·65 ml. per kgm. of body weight.

The number of persons treated in each group, the site and severity of their wounds, the method of treatment employed, and the number of deaths from rabies during an observation period of 10 months may be summarized as under:

Group A: 5, with head wounds (4 very serious); each received serum on the 1st and 5th days and vaccine (first injection 24 hours after first inoculation of serum) for 21 days. No deaths.

Group B: 7, with head wounds (5 very serious); each received serum on the 1st day and vaccine, begun on 2nd day, for 21 days, except in the case of one person, the most severely wounded in the group, who developed symptoms of rabies on the 18th day, and died on the 22nd day, after the date of the bite. This patient had received 40 ml. of serum plus 16 vaccine injections.

Group C: 5, with head wounds (3 very serious); each received vaccine for 21 days, the first injection on the 1st day of treatment; 3 developed symptoms of rabies on, respectively, the 29th, 29th and 59th day, and died on the 31st, 32nd and 62nd day, after the date of bite.

Group D: 4, with wounds on trunk or limbs, in no case severe; each received 1 inoculation of serum plus a full course of vaccine. No deaths.

Group E: 7, with wounds on trunk or limbs, in no case severe; each received a full course of vaccine only. No deaths.

The above results speak for themselves. The most striking case, however (one not included in that summary), Case No. 27, was that of a 6-year-old boy whose parietal bone had been smashed and dura mater torn by the wolf's teeth, but who, in spite of this "intracranial inoculation" resisted the infection as a result of 6 injections of serum (serum on 1st, 3rd, 5th, 7th, 9th and 11th days of treatment) combined with a full course of vaccine. *G. Stuart*

Habel, K. & Koprowski, H. **Laboratory Data supporting the Clinical Trial of Antirabies Serum in Persons bitten by a Rabid Wolf.** *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 5, 773–9.

The clinical study of the cases of wolf-bite treated in Iran by Baltazard *et al.* [see above] with either vaccine alone or vaccine plus serum was supplemented by laboratory investigations.

Firstly, in order that the clinical results might be properly evaluated, the potency of the hyperimmune serum and of the vaccine used in the

treatment had to be determined. Serum-virus neutralization tests showed that the serum had a minimum protective titre of 1 in 1,060. A Habel potency test showed that the vaccine, when tested some 2 months after its expiration date, still had a protective power of 2·8 logs. (protection against 631 LD 50 of virus)—a finding which implied a protective power of probably 3·5 logs. at the time of use.

Secondly, the titres of neutralizing antibody in the sera of patients, bled at fixed intervals from the commencement of treatment up to, in some cases, the 53rd day, were determined by the mouse neutralization test in an attempt to correlate the clinical outcome in individual cases with the level of neutralizing antibody present in their sera. The present paper records the results of such tests on the sera of those cases treated for wolf-bites on the head, namely, groups A, B and C, and case No. 27.

In group A antibodies on an intermediate level were present in all five patients during the first 5 days; were maintained at that level up to the 21st day; and subsequently declined up to the 53rd day; in one patient a high antibody level persisted from the 21st to the 53rd day.

In group B antibody titres were intermediate during the first 5 days, declined to low in 4 patients by the 21st day and continued low. The one fatal case in this group failed to develop more than a faint trace of antibody beyond the 7th day.

In group C antibodies failed to develop in any individual before the 19th day; were present on an intermediate level between the 21st and 25th day in 3 cases (2 deaths); and were absent throughout in 2 cases (1 death).

In case No. 27 a high level of antibody continued during the whole period of observation.

Although from these results no conclusions could be drawn as to the quantitative levels of antibody necessary to afford protection, " it is apparent that antibody demonstrable early in and throughout the treatment period, and obtained by the combined use of serum and vaccine, is more effective in preventing rabies after severe exposure than is a course of vaccine alone ". The passive antibodies introduced by the hyperimmune serum into the blood of the patient after the bite would appear to hold the infection in check until the antibodies, which ordinarily develop between the 14th and 21st days in the course of vaccine treatment, come into action. In this latter connexion the potency of the vaccine and the ability of the patient to produce antibody are obviously the limiting factors. *G. Stuart*

Samso, A. & Viel, R. Vaccination antirabique et cancer. [**Anti Rabies Vaccination and Malignant Growths**] *Bull. Algérien Carcinologie.* 1955, v. 8, No. 25, 25–30.

According to reports from the United States three persons suffering from melanotic sarcoma had, in the period 1940–1949, shown marked

improvement after a course of anti-rabies vaccine: retrogression of the primary tumour and, in one case, of the metastases had occurred. These results prompted the authors to study in Algeria the influence antirabies vaccination might have on malignant tumour formation in animals.

To this end they first made enquiries into the vaccination histories of dogs, from which tumours had been removed by veterinarians and submitted for histological diagnosis. Results showed that of 41 dogs, in which proof of malignant growths was established, 29 (70 per cent.) had a record of previous prophylaxis against rabies by Plantureux's method. Moreover 4 other dogs, despite such prophylactic treatment, later developed malignant tumours: one developed epithelioma, one fibrosarcoma and two melanotic sarcoma.

The authors then tried the effect of anti-rabies vaccination on groups of white mice, in which various types of malignant tumour had been experimentally induced. Whether the vaccine was given before or after the mice had been inoculated subcutaneously with ascitic fluid from the tumours employed—those of Ehrlich or of Krebs II—results, as measured by survival times, differed in general, little, if at all, from those in unvaccinated control groups, which had received only injections of tumour material. Only in one group, which had been inoculated with fluid from the Ehrlich tumour and thereafter immediately treated with Fermi-type vaccine, was there a prolongation of the survival time, as well as necrosis of the neoplasm. *G. Stuart*

Reagan, R. L., Yancy, Frances S., Chang, S. C. & Brueckner, A. L. **Transmission of Street Rabies Virus Strain (V308) to Suckling Hamsters during Lactation.** *Proc. Soc. Exper. Biol. & Med.* 1955, Oct., v. 90, No. 1, 301–2.

The object of the experiment described in this article was to determine, if possible, whether or not a lactating animal infected with rabies may contain the virus of that disease in its milk and, if so, may thus transmit the infection to its sucklings.

Ten lactating Syrian hamsers and their sucklings were used in the experiment, the 10 groups being placed in individual metal boxes. Group No. 10 was kept as a room control. When the sucklings were 12 days old, the mother was temporarily removed from each of the other 9 groups and inoculated in the flank muscle with 0·1 ml. of a 10 per cent. mouse-brain suspension of street rabies virus. The virus used in this inoculum was a canine strain at its second intracerebral passage in 3-week-old Swiss albino mice and, when titrated intracerebrally in such mice, had a titre of $10^{-3\cdot5}$. Before the mothers were returned to their sucklings the site of inoculation was in each case sterilized with iodine for one hour. Six days after the inoculation of the parent the sucklings from each of the 9 groups were weaned and

placed in special glass jars. At the same time the sucklings in the control group were weaned and transferred to similar containers.

Of the 9 inoculated lactating hamsters 7 developed rabies between 14 and 22 days after their inoculation; 15 of 23 of the suckling hamsters developed rabies symptoms between 8 and 22 days after the inoculation of the adults, *i.e.*, between 2 and 16 days after weaning. Confirmation of rabies was made in all positive cases by the demonstration of Negri bodies in the Ammon's horn of the adult hamster and of the suckling hamster and in the Ammon's horn of Swiss mice after intracerebral inoculation with brain material from these hamsters.

From these results it would appear that rabies may be transmitted from lactating hamsters to suckling hamsters. The possibility exists, however, that rabies virus was present in the saliva of the mothers before their sucklings were weaned and that, in consequence, infection could have occurred by some route other than the milk, *e.g.*, by biting or as a result of licking. *G. Stuart*

Béládi, I. & Szöllösy, E. **Production of Plaques in Monolayer Tissue Culture by Aujeszky-Disease (Pseudorabies) Virus.** *Acta Microbiologica.* Budapest. 1955, v. 3, Nos. 1/2, 213–17, 1 fig.

Iványovics, G., Béládi, I. & Szöllösy, E. **Variation of the Cytopathogenic Activity of Aujeszky-Disease (Pseudorabies) Virus.** *Acta Microbiologica.* Budapest. 1955, v. 3, Nos. 1/2, 159–72, 4 figs. [19 refs.]

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Mukherji, A. **Hemolytic Vibrios in Cholera Epidemic at Lucknow in 1945.** *Indian J. Med. Sci.* 1955, Sept., v. 9, No. 9, 540–43.

This paper, read at the Indian Science Congress Association in 1947, records and describes the isolation of haemolytic vibrios from cases of cholera occurring at Lucknow in 1945. Sporadic cases of cholera appeared in April of that year and vibrios agglutinated by Ogawa O monospecific serum were isolated from the stools of 8 of them; 6 of these vibrios produced greenish haemolysis on goat-blood agar plates; the remaining 2 were not tested. These vibrios fermented sucrose but not arabinose.

Epidemic cholera broke out on 1 May and, in a few days, with explosive violence and a high mortality. Vibrios were isolated from 43 of 111 cases diagnosed, on clinical grounds, as cholera; 21 strains were agglutinated by O Ogawa serum and 4 by both Ogawa and Inaba serum; 16 were haemolytic on blood agar plates and 13 were haemolytic by Greig's test. When falling quantities of culture, 1·0 cc., 0·5 cc. and 0·1 cc., were added to the sheep cell suspension haemolysis was most marked in the tubes receiving 0·1 cc. and much less in those receiving 1 cc. All 13 strains agglutinable with O Ogawa serum and Greig positive gave a positive Voges-Proskauer reaction.

The author claims that these vibrios were responsible for the cholera outbreak in Lucknow in 1945 but suggests on epidemiological grounds that they may be a different species from the Celebes vibrio.

[Since all the agglutinable vibrios were haemolytic, gave a positive Voges-Proskauer reaction and are said to have belonged to Heiberg's Group 1, though no mention is made of their reaction with mannose, they would appear to be related to the El Tor vibrio. *C. C. B. Gilmour*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Sarkisjan, M. A. [**Incidence of Amoebiasis and of Carriers of** *Entamoeba histolytica* **in an Endemic Focus**] *Med. Parasit. & Parasitic Dis.* Moscow. 1955, v. 24, No. 4, 311–16. [In Russian.]

The author describes the results of an investigation on the prevalence and course of amoebiasis carried out in the course of 3 years (1951–3) in an endemic area of the Armenian Soviet Republic. Among 1,098 patients suffering from various intestinal disorders, clinical amoebiasis was diagnosed in 87 (7·9 per cent.). Among 45 patients, who were passing the tissue forms of *Entamoeba histolytica*, dysentery bacilli were detected in 5 cases. In cases of chronic amoebiasis the patients usually passed the commensal ["*minuta*"] forms of amoebae. The majority of amoebic infections occurred during the hot months (May–October).

In addition to patients with intestinal disorders, the author examined 702 healthy persons in the same area, 27·5 per cent. of whom proved to be symptomless carriers of *E. histolytica*. It is noted that carriers very rarely developed clinical symptoms, thus among 152 carriers observed during 2 years only 2 such cases occurred. *C. A. Hoare*

Loran, Muriel R., Kerner, M. W. & Anderson, H. H. **Cytochemical Differentiation of Components of *Entamoeba histolytica* (with special reference to Variations occurring with Different Associated Organisms).** *Exper. Parasit.* New York. 1955, Nov., v. 4, No. 6, 542–7, 6 figs.

Earlier work by Hallman *et al.* [this *Bulletin*, 1955, v. 52, 636] has indicated that more than one type of polysaccharide is present in *E. histolytica*. These authors were of the opinion that the type was affected by the presence of different nutritional agents. The present authors have used strains of *E. histolytica* accompanied by *T. cruzi* or by different single bacterial species. Standard staining techniques were used after fixation of specimens with formaldehyde. On staining with toluidine blue and Hale stain, results indicated that an acid polysaccharide was present in the cytoplasm and nucleus of *E. histolytica*, but not on the outer surface of the trophozoite. Ceric ammonium nitrate which combines with hydroxyl groups of polysaccharides prevented the staining reaction. The variations in staining reactions of cytoplasm and limiting membrane of the amoeba were studied under different cultural conditions. It appeared that the associate accompanying the amoeba in culture caused greater variations in results than the strain of amoeba employed. Hyaluronidase and collagenase interfered with staining, suggesting that in these staining reactions a hyaluronic acid type of polysaccharide is present in nucleus and cytoplasm while a collagen type is present in the outer membrane. *J. D. Fulton*

Becker, C. E. & Geiman, Q. M. **Utilization of Glucose by Two Strains of *Entamoeba histolytica*.** *Exper. Parasit.* New York. 1955, Nov., v. 4, No. 6, 493–501. [12 refs.]

In an attempt to gain information on the metabolic requirements of *E. histolytica* the authors [*J. Amer. Chem. Soc.*, 1954, v. 76, 3029] made a study of the amino-acid composition of this parasite. The results of different authors are not in agreement as to its carbohydrate requirements [this *Bulletin*, 1953, v. 50, 708; 1954, v. 51, 584]. The present authors have now studied the fate of ^{14}C-labelled glucose in cultures of *E. histolytica* with mixed bacterial flora and with the latter organisms alone, by comparing the amounts of labelled CO_2 and glycogen formed in each. The amoebae were grown in 15 ml. centrifuge tubes in a medium rich in potassium, to which rice starch, glucose, pteroylglutamic acid and liver extract were added. Even after 24 hours bacterial over-growth took place and this was avoided by substituting glucosone for rice starch and glucose. The amoebae were washed and centrifuged in the tubes in which culture took place. Penicillin, streptomycin and approximately 1 μc labelled glucose were added to each tube with amoebae and to

tubes with bacteria alone to act as controls. The tubes were incubated at 37°C. for 2 to 23 hours. The CO_2 evolved was collected in alkali and converted to barium carbonate. Glycogen was obtained from the amoebae by known procedures and its activity measured after hydrolysis. No glycogen was obtained from control tubes in which amoebae were absent. From measurement of CO_2 activity and from glycogen analysis it was concluded that extracellular glucose was utilized by *E. histolytica*.

J. D. Fulton

Kerner, M. W. & Anderson, H. H. **The Uptake of Yttrium and Cerium by Viable *Entamoeba histolytica* in Culture.** *Exper. Parasit.* New York. 1955, Nov., v. 4, No. 6, 564–8, 6 figs.

"It has been shown that yttrium and cerium (Ce^{144}) will outline in visible light the nucleus of *Entamoeba histolytica*. This is believed to be due to combination of the rare earth with nucleic acid of the nucleus as well as to combination of the rare earth with the acid mucopolysaccharides of the cytoplasm and nucleus."

Villari, A. & Digilio, V. Le reazioni immun-biologiche nella diagnostica di laboratorio dell'amebiasi. [**Immuno-Biological Reactions in the Laboratory Diagnosis of Amoebiasis**] *Acta Med. Italica.* 1955, May, v. 10, No. 5, 119–26, 1 chart. [72 refs.]

Having had the opportunity to observe numerous cases of amoebiasis in the University Clinic of Infectious and Tropical Diseases at Naples, the authors undertook an investigation on the value of the following immuno-biological reactions for the diagnosis of this disease: precipitin, intradermal and complement-fixation. For these tests ready-made commercial antigens of *Entamoeba histolytica* were used, while the human material consisted of patients with amoebiasis, non-amoebic colitis and other infections, as well as normal controls.

None of these tests produced sufficiently specific reactions to be of diagnostic value in amoebiasis. *C. A. Hoare*

Brown, J. A. H. & Whitby, J. L. **An Immobilization Test for Amoebiasis.** *J. Clin. Path.* 1955, Aug., v. 8, No. 3, 245–6, 1 fig.

It has been shown by Cole and Kent [this *Bulletin*, 1954, v. 51, 385] that immune rabbit sera immobilized *Entamoeba histolytica*. In order to ascertain the diagnostic value of this test for human amoebiasis, the present authors studied this phenomenon with sera from cases of human amoebiasis, to which the complement-fixation test [CFT] was also applied for comparison.

For the immobilization test, pooled sediments of 48-hour cultures, containing 200,000–400,000 amoebae per ml. were used. Then equal volumes of the serum to be tested and of amoebic suspension were mixed in a tube, and fresh microscopic preparations of samples of the mixture, which were incubated at 37°C., were examined at intervals. The results were expressed as percentage of rounded or immobile amoebae observed among 25 counted, only sera showing upwards of 70 per cent. immobilization during the first hour being regarded as positive.

All the sera tested were obtained from proved cases of amoebiasis, except two which had a history of amoebiasis and were suspected as relapses. Out of 25 sera, 6 were positive to the immobilization test, 3 were doubtful and 16 (including the 2 " relapse " ones) were negative. Parallel CF tests with the same sera were positive in 3 cases (including one which was negative in the immobilization test). Maximum immobilization was reached at 30 minutes, after which mobility of the amoebae was usually gradually restored. It was also found that positive sera, which had not been inactivated to destroy complement, lysed the amoebae.

The low degree of antigenicity of *E. histolytica*, already revealed in the CFT. is thus also reflected in the immobilization test, which was found to be not much more sensitive than the former, and moreover involved more technical difficulty. *C. A. Hoare*

Giordano, A. F. La protozoosis intestinal en algunas dermatosis reactivas. [**Intestinal Protozoal Infections in Various Forms of Allergic Dermatitis**] *Rev. Sanidad Militar Argentina.* 1954, Jan.–Mar., v. 53, No. 1, 66–78. [12 refs.]

The author, from a Central Military Hospital in Argentina, discusses the literature on allergic manifestations in intestinal protozoal disease, especially amoebic infections.

He then describes 127 cases of dermatitis in 58 of which (45·6 per cent.) intestinal protozoa were present. The common parasites *E. histolytica*, *E. coli*, *Giardia* and *Chilomastix* were respectively 11 (8·6 per cent.), 17 (13·4), 10 (7·8) and 4 (3·1 per cent.). The findings are shown in detail in a table, under the type of dermatitis, the number of cases with parasites and the species, and the results obtained from treating the parasitic infection. The commonest skin conditions seen were urticaria, eczema and alopecia (respectively 31, 32 and 11 cases). Good results were obtained by specific treatment of the parasitic infection, especially those associated with *E. histolytica*.

The local and non-specific treatment used is discussed at length, as is the specific treatment for the parasitic infection, with emphasis on the acute and chronic amoebic infections. The various schedules of the usual drugs and antibiotics are described. *H. J. O'D. Burke-Gaffney*

Kean, B. H. **Amebic Hepatitis. Absence of Diffuse Lesions at Autopsy and in Biopsies.** *Arch. Intern. Med.* 1955, Nov., v. 96, No. 5, 667–73. [32 refs.]

Amoebic hepatitis is commonly diagnosed on liver enlargement and tenderness, slight to moderate fever, a moderate leucocytosis, and laboratory evidence of liver dysfunction in a patient with a history of intestinal amoebiasis. Various workers have stated that "diffuse amebic hepatitis" is a very common clinical finding in patients with intestinal amoebiasis, though there is little anatomical evidence to sustain this belief. In any ulcerative condition of the bowel bacteria, débris and other "noxious" material may be carried to the liver and cause a reaction there; this may be the explanation of the syndrome attributed to diffuse amoebiasis of the liver. A response to anti-amoebic treatment may be attributable to the healing of the amoebic lesion in the large bowel, and not to specific action on amoebae in the liver; this response therefore is not evidence of a true amoebic infection of the liver.

The author has made histological studies of the livers obtained from 4,478 consecutive autopsies, in 148 fatal cases of amoebiasis, and in 50 biopsies of patients with a clinical syndrome of "diffuse amebic hepatitis". In none has he been able to find diffuse lesions due to *Entamoeba histolytica* infection of the liver. [See also da Silva, this *Bulletin*, 1956, v. 53, 187.] *A. R. D. Adams*

Sappenfield, R. W., Carter, F. R. N., Culbertson, C., Brooke, M. M., Payne, F. M. & Frye, W. W. **Therapeutic Aspects of a Water-Borne Outbreak of Amebiasis in South Bend, Ind.** *J. Amer. Med. Ass.* 1955, Nov. 5, v. 159, No. 10, 1009–12. [Refs. in footnotes.]

After examination of the stools of about half of the employees of a wood-working plant in South Bend, Indiana, it was inferred that some 800 of the 1,500 employees harboured *Entamoeba histolytica* infections. Therefore stool specimens from all the employees were specifically searched for the parasite; 52·4 per cent. of the 1,542 employees were found to harbour the parasite. Each was treated for the infection when its presence was disclosed. Alternate patients were given fumagillin (20 mgm. twice daily for 10 days) or oxytetracycline (1 gm. twice daily for 10 days). Two weeks after completion of the treatment stools were examined once weekly for 3 weeks. Those found still to be infected were re-treated with the alternative drug, and thereafter re-examined in the same manner. Three to 4 months later another single specimen from each patient was examined. Of 358 treated with a single course of treatment with oxytetracycline 338 were apparently freed of their infections; the 20 who were not cured were given fumagillin, and 16 of them were thereafter sterilized of their infections. Of the 356 treated with fumagillin 334 were apparently sterilized of their infections; of the 22

not cured 13 were re-treated with oxytetracycline, and all but 2 thereafter were sterilized of their infections.

From the documentation in this paper it is not clear what proportion of the infections caused symptoms, but information on the matter is presumably in another paper at present in the press. The oxytetracycline course of treatment caused some bowel looseness, and colic and nausea, usually after the fourth day; anal itching and rectal burning followed the treatment in about 10 per cent. The fumagillin course caused bowel looseness, colic, nausea, headache and lassitude; a skin rash, at first papular but later becoming vesicular, developed on the hands and sometimes the feet and arms, in about 10 per cent. of patients within a week of the end of treatment. The authors consider that both oxytetracycline and fumagillin are effective and relatively non-toxic amoebicides, which produce a cure rate of over 90 per cent.

The probable source of infection in this outbreak was a contaminated water supply [this *Bulletin*, 1955, v. 52, 777]; this defect was corrected before treatment was started. *A. R. D. Adams*

Schensnovich, V. B. [**Pathogenicity of Strains of** *Entamoeba histolytica* **recovered from Healthy Carriers**] *Med. Parasit. & Parasitic Dis.* Moscow. 1955, v. 24, No. 4, 317–21. [13 refs.] [In Russian.]

The work described in this paper was undertaken in order to determine whether strains of *Entamoeba histolytica* isolated from healthy human carriers differed in pathogenicity for laboratory animals from strains isolated from cases of amoebic dysentery.

For this purpose 14 strains were isolated (between 1951 and 1954) from healthy persons in the Karelo-Finnish Soviet Republic (10) and Moscow (4), none of whom had suffered in the past from intestinal disorders attributable to amoebiasis. For comparison, a strain was obtained from a patient with amoebic dysentery, the virulence of which for laboratory rodents had been repeatedly confirmed.

The virulence of each strain was tested by intracaecal inoculation of 10–15 young rats with 48–72-hour cultures grown on Pavlova's medium, and the results were assessed by examination of the caecal wall and contents of the animals killed 5–6 days later, when the presence or absence of amoebae and of lesions, as well as the degree of ulceration, were noted and scored.

It was found that all the strains were pathogenic for rats, in that each produced ulceration in some of the animals. However, the number of rats infected and the degree of ulceration produced by carrier strains were considerably lower than those produced by the control strain from the case of amoebic dysentery. It is concluded that all strains of *E. histolytica*, whether derived from clinical cases or carriers, are

potentially pathogenic, but their power to produce disease in rats varies, and it is probable that this parasite is represented by strains varying from the slightly virulent in carriers to the highly virulent in cases of dysentery.

In comparing these results with those obtained in similar experiments by Neal and Vincent [this *Bulletin*, 1955, v. 52, 1087] the author does not regard them as being contradictory. *C. A. Hoare*

Phillips, B. P., Wolfe, Patricia A., Rees, C. W., Gordon, H. A., Wright, W. H. & Reyniers, J. A. **Studies on the Ameba-Bacteria Relationship in Amebiasis. Comparative Results of the Intracecal Inoculation of Germfree, Monocontaminated, and Conventional Guinea Pigs with** *Entamoeba histolytica*. *Amer. J. Trop. Med. & Hyg.* 1955, July, v. 4, No. 4, 675–92, 9 figs. [22 refs.]

The dependence of *Entamoeba histolytica* upon bacteria for growth *in vitro* is now a well established fact, but the rôle played by the intestinal flora in the course of human amoebiasis is still uncertain, though it has been suggested that it might be an important factor in the pathogenesis of this infection.

In the present paper an account is given of investigations in which this hypothesis has been put to experimental test. For this purpose cultures of *E. histolytica* grown with *Trypanosoma cruzi* were inoculated intracaecally into the following 3 groups of young guineapigs, each of which received 300,000 amoebae: (1) 35 "germfree" animals, obtained by Caesarian section and reared free of bacteria in a special apparatus; (2) 37 "conventional" animals, *i.e.*, with normal mixed intestinal flora, which served as controls; and (3) 32 "monocontaminated" animals, representing originally "germfree" individuals, of which 20 were inoculated with a *Streptobacillus*, 7 with *Bacterium coli*, and 5 with *Bact. aerogenes*.

The guineapigs were fed on sterilized food and were killed at different intervals, after which their intestines were examined macroscopically for lesions and microscopically for histopathological changes and for the presence of amoebae, as well as by cultivation of the gut contents.

The results of these experiments were as follows. None of the "germfree" guineapigs developed amoebic lesions, and their infection was of short duration (maximum 5 days) with scanty amoebae. On the other hand, over 90 per cent. of the "conventional" guineapigs developed acute ulcerative amoebiasis. Similar results were obtained with the "monocontaminated" animals infected with *Bact. coli* or *Bact. aerogenes*, whereas in those harbouring the *Streptobacillus* only, rare amoebae were found in the faeces and the gut wall remained intact. A detailed and illustrated description is given of the pathological changes in the infected guineapigs, which were more severe in the "conventional"

animals than in the " monocontaminated " ones. In order to determine whether bacteria alone were capable of producing these pathological changes a few animals which harboured *Bact. coli* or *Bact. aerogenes*, but had not been inoculated with *E. histolytica*, were examined histologically, but their intestines proved to be normal.

It is concluded " that although *E. histolytica* is unquestionably the causative organism of intestinal amebiasis, the responsibility for the disease must be shared with other microorganisms, the activities of which contribute to the aetiology, pathogenesis, and pathology. In the absence of such microbial associates the ameba appeared to be a harmless microbe incapable of independent survival in the intestine." *C. A. Hoare*

Gardocki, J. F., Timmens, E. K., Wilson, L. B., Sodergren, J. O., Hettinger, B. R. & P'An, S. Y. **Acute and Chronic Toxicity of Anisomycin in Experimental Animals.** *Antibiotics & Chemotherapy.* New York. 1955, Sept., v. 5, No. 9, 490–95.

Anisomycin (Flagecidin) is an antibiotic which may be of value in the treatment of protozoal infections including amoebic dysentery [this *Bulletin*, 1955, v. 52, 155]. This is a report from the Research Laboratories of Chas. Pfizer & Co. on a comprehensive series of tests of its toxicity. In mice and rats the LD 50 in mgm./kgm. by the oral, intravenous, intraperitoneal and subcutaneous routes are respectively 148, 140, 400, 600 and 72, 167, 345, 230 [that in rats the substance should be more than twice as toxic by the oral route as by any other is most unusual: this peculiar feature is not explained]. Rabbits and guineapigs withstood somewhat larger doses. In cats and dogs even very small doses given either orally or parenterally regularly caused vomiting. This symptom caused some, but less, difficulty in monkeys, which survived doses of 300 and 80 mgm./kgm. by the oral and intravenous routes respectively. Daily oral administration of different doses to rats and monkeys for less than 30 weeks caused no observable ill effects except vomiting and diarrhoea from larger doses in the latter: there were no changes in renal function or in the blood. *L. P. Garrod*

McConnachie, Elspeth, W. **Studies on** *Entamoeba invadens* **Rodhain, 1934,** *in vitro*, **and its relationship to some other Species of** *Entamoeba*. *Parasitology*. 1955, Nov., v. 45, Nos. 3/4, 452–81, 13 figs. [43 refs.]

This long and interesting paper does not lend itself readily to summary and should be read in the original by those interested. A brief survey of the literature by the author indicates that *Entamoeba invadens* is restricted to reptiles, but its distribution in nature is not accurately known. Morphologically and in other ways it bears a strong resemblance

to *E. histolytica*. In some respects the pathology of the infection in reptiles infected with *E. invadens* resembles that in man infected with *E. histolytica*, but liver abscess and a fatal termination occur more often with the former.

Because of the many similarities between these two amoebae the question has arisen whether they belong to the same species. In order to gain information on this point a detailed study was carried out with *E. invadens in vitro* and for this purpose different strains of the organism were used. The author [this *Bulletin*, 1954, v. 51, 930] has already indicated its reaction to amoebicidal drugs. It was grown with *Bacterium coli* alone or with this organism accompanied by another not identified. Other strains were associated with *Bacillus megatherium* and the same unknown organism as above. The character of the medium as well as the nature of the bacteria present affected the growth of *E. invadens*, which was stimulated by the presence of starch. The interesting observation of earlier workers was confirmed that in cultures exhausted of starch, cysts were engulfed by the amoebae. A similar observation for *E. histolytica* was made by Cleveland and Sanders [*ibid.*, 1930, v. 27, 887]. Compared with the growth of *E. histolytica* that of *E. invadens* was much slower in culture, and this fact was probably related to difference in optimum temperature for growth. Red cells were not readily ingested by *E. invadens*. Rat erythrocytes appeared to be preferred to those of chick or frog. The percentage of cysts present varied from medium to medium and from strain to strain. Depletion of starch in the medium, unlike what occurs with *E. histolytica*, caused an increase in the percentage of cysts formed. The degree of encystation was also affected by the types of bacteria present, but change in *p*H of the medium appeared to exercise little influence. Amoebae were readily killed by HCl, but the cysts were more resistant to chemicals than those of *E. histolytica*. Probably as a result of conditions in the natural host, trophozoites of *E. invadens* survive better than those of *E. histolytica* outside the temperature of optimal growth. Cysts survived better below than above the temperatures of optimal growth. Oxygen exercised a markedly toxic effect. The only significant differences between *E. invadens* and *E. histolytica* are to be found in the conditions required for encystation and in the temperature range within which growth will occur. The relationship of *E. invadens* to other species of amoeba is discussed. *J. D. Fulton*

Dodds, Shirley E. & Elsdon-Dew, R. **Further Observations on Human Coccidiosis in Natal** *South African J. Lab. & Clin. Med.* 1955, June, v. 1, No. 2, 104–9, 2 figs.

The authors record the incidence and seasonal distribution of human *Isospora* infections in Durban during 6 years (1949–54), which are represented graphically in 2 figures. It is noted that whereas previously

the findings of *I. belli* exceeded those of *I. hominis* by 16 to 1, since 1952 the latter showed a preponderance of 4 to 1, indicating an improvement in the differential diagnosis between the two species. The seasonal occurrence of the two coccidia is also different, *I. belli* being more common in the autumn (March–May) and *I. hominis* in winter (June–August). Both species were found to be more common in children under the age of 6 than in adults. *I. natalensis* has not been recorded again, and it is thought that it might have an animal reservoir.

It was found that oöcysts of these coccidia can be stored in 0·5 per cent. formaldehyde, in which *I. belli* remains viable for 7 and *I. hominis* for 4 months. [For earlier studies by Elsdon-Dew and his colleagues, see this *Bulletin*, 1951, v. 48, 366; 1954, v. 51, 63, 183.]

C. A. Hoare

de Carneri, I. *Trichomonas hominis* **cultured without Bacteria.** [Correspondence.] *Nature.* 1955, Sept. 24, v. 176, 605.

As is known, like other human intestinal protozoa, *Trichomonas hominis* does not grow in culture without the concomitant bacteria. Optimum growth under these conditions is obtained in Dobell's diphasic media (*e.g.*, HShs) at 25°C., whereas, when cultivated in Johnson and Trussell's CPLM medium (*Proc. Soc. Exper. Biol. and Med.*, 1943, v. 54, 245) at 37°C., the flagellates are rapidly swamped by the bacteria. This can be avoided by adding to the medium 1,000 μgm./cc. streptomycin and 1,000 units/cc. penicillin. After 3 subcultures, to which the antibiotics have been added, it was found—by sterility tests in bacto-thioglycolate medium—that *Trichomonas* was freed from bacteria and could be grown in pure culture for 4 months, with transfers every 3 weeks, attaining a concentration of over 2 million flagellates per cc.

C. A. Hoare

Svensson, Ruth. **On the Resistance to Heating and Cooling of** *Balantidium coli* **in Culture and some Observations regarding Conjugation.** *Exper. Parasit.* New York. 1955, Nov., v. 4, No. 6, 502–25.

Klink, G. E. & Burrows, R. B. **Ingestion of** *Trichuris trichiura* **Ova by** *Balantidium coli.* [Research notes.] *J. Parasitology.* 1955, Dec., v. 41, No. 6, 634, 4 figs.

Bogdanovich, V. V. [**Spontaneous Balantidiosis in Rats**] *Med. Parasit. & Parasitic Dis.* Moscow. 1955, v. 24, No. 4, 326–9, 2 figs. [In Russian.]

The author examined 150 wild rats (*Rattus norvegicus*) in Dnepropetrovsk [Ukraine], 6 of which proved to be infected with *Balantidium.*

While in two of the animals the intestinal wall appeared to be normal, in the others it showed lesions and histopathological changes comparable to those found in human balantidiosis. In view of this, and because previously Russian workers have succeeded in infecting rats with *B. coli*, it is suggested that the human and murine parasites are identical.

C. A. Hoare

Matabeli, G. V. [**Clinical Course, Treatment and Prophylaxis of Balantidiosis**] *Med. Parasit. & Parasitic Dis.* Moscow. 1955, v. 24, No. 4, 322–6. [15 refs.] [In Russian.]

The author describes observations of human balantidiosis in a village of the Georgian Soviet Republic, where the disease is endemic. Among 94 persons, 44 had a latent infection and represented contact or convalescent carriers, while 50 patients suffered from an acute or chronic relapsing form of the disease, the symptoms of which are described in detail.

Yatren and Osarsol proved to be specific in the treatment of this disease. The effective course of treatment with Yatren was 30–40 mgm., administered in daily doses of 1·5–3 gm., while Osarsol was administered in 2–4 cycles, in doses of 0·25 gm. (tablets) 4 times daily for 5 days with intervals of 4–5 days. Promising results were also obtained with Biomycin, administered in doses of 2 gm. daily (total course 25–28 gm.).

C. A. Hoare

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Walton, G. A. **Relapsing Fever in the Digo District of Kenya Colony.** *East African Med. J.* 1955, Oct., v. 32, No. 10, 377–93, 2 figs. & 3 maps.

The author gives an account of a survey of an area of about 1,150 sq. miles of Kenya Colony, extending south from Mombasa to the Tanganyika border, including a sandy coastal strip and a larger hinterland reaching a mean height of about 500 feet. The total population is estimated at 80,000, and 2 per cent. of the African houses were examined as a random sample, in addition to visits made to houses known to be tick-infested. Less than 50 cases of relapsing fever have been recorded from this district during the 10 years 1945–1954 and the severity of these cases suggests that the population is very rarely infected by ticks, rather than immune from infection. The carrier *Ornithodorus moubata*, was found to be restricted to an area of some 8 square miles, and around Tiwi, Waa and Ngombeni 90 per cent. of the houses were tick-infested. The average number collected was 27 per infested hut and it is estimated that there were at least 2,800 infested houses in this area. Ticks

were almost entirely absent in the surrounding country, and in the remaining 1,070 sq. miles only 12 widely scattered infested houses were found.

The author discusses some of the factors which may affect the distribution of ticks in the Digo District and shows that for a satisfactory explanation it is necessary to consider more than the climatic influence. Domestic fowls form the main source of food in the area, and in one series of 124 samples, 113 had fed only on domestic fowls, 8 only on man, 2 on man and fowl, and 1 on sheep or goat. It is of interest, therefore, that 74 per cent. to 76 per cent. of the African houses in the tick-infested coastal area contain domestic fowls, but only 30 per cent. in the tick-free wet coastal area. Moveable bedsteads were found to be a definite deterrent to tick infestation, and were more common in the wetter areas of the region studied. Domestic animals, such as sheep and goats, could be excluded as an unfavourable factor in the wet coastal areas, since very few houses have them, and in the hinterland few huts were infested to provide any comparison.

Relapsing fever is evidently not a problem to cause concern at present in the Digo District, but the situation seems to depend on the abundance of domestic fowls kept inside the houses. Two hundred ticks collected from various villages were examined for spirochaetal infection by inoculating the mixed contents of batches of 10 ticks, one-half into a rat and one-half into a fowl; 3 of the 20 rats inoculated developed typical spirochaetal infections, but all the fowls remained negative. It is highly probable therefore that the ticks in this district would be capable of infecting man, as in other endemic foci, and if the fowls were removed an outbreak of relapsing fever might occur. The possibility of controlling the ticks by the use of BHC is discussed, but the Local Native Council were interested only if the dust could be guaranteed to kill bed-bugs, fleas, jiggers and cockroaches in addition; if the dust killed only ticks they were definitely not interested. *Edward Hindle*

Geigy, R. & Mooser, H. Untersuchungen zur Epidemiologie des afrikanischen Rückfallfiebers in Tanganyika. [**Studies on the Epidemiology of African Relapsing Fever in Tanganyika**] *Acta Tropica*. Basle. 1955, v. 12, No. 4, 327–45, 10 figs. [12 refs.]

[See this *Bulletin*, 1956, v. 53, 196, for an account in English.]

Horrenberger, R. Transmission expérimentale de *Spirochaeta hispanica* de Buen, 1926, par morsure de cobaye. [**The Experimental Transmission of *Spirochaeta hispanica* by the Bite of Guineapigs**] *Arch. Inst. Pasteur d'Algérie*. 1955, Sept., v. 33, No. 3, 258–63.

The author has continued his observations on the transmission of *S. hispanica*, the agent of Spanish-North-African relapsing fever, to white

rats, guineapigs and dogs by means of the bites of infected rats [this *Bulletin*, 1955, v. 52, 783]. In the present series of experiments he shows that during the height of a spirochaetal attack young guineapigs can also transmit the disease to other guineapigs and white rats by their bite. The saliva is also infective in about 60 per cent. of infected young guineapigs, the same proportion as in the case of infected rats. The bite of a guineapig with infected saliva is more certainly infective than in rats, but only young animals have been found to be capable of transmitting the disease in this manner. *Edward Hindle*

Ranque, J., Depieds, R. & Nicoli, R. M. Recherche des immobilisines antitréponémiques dans les spirochétoses autres que les tréponématoses. [**Research into Treponemal Immobilization in Spirochaetoses other than Treponematoses**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 326–8.

False serum reactions for syphilis may occur in diseases caused by spirochaetes similar to those of syphilis. These authors carried out immobilization reactions in human beings and animals infected with the spirochaetes of relapsing fever, leptospirosis and Vincent's angina. In 2 cases of human infection with *Spirochaeta hispanica* immobilization reactions were 2 and 4 per cent. respectively (*i.e.* negative); in 1 case the Kahn reaction was doubtful. In 21 guineapigs infected with *Sp. hispanica* and with an average survival time of 13 days, immobilization percentages varied from 0 to 9, all negative.

Two patients suffering from leptospirosis were both negative; in 8 other cases the Nelson test was negative in 7 and positive in 1; this last was a clear case of syphilis with a positive Wassermann reaction. Vincent's angina may give false positive classical reactions due to the spirochaete itself or possibly to malnutrition. Of 9 sera from patients with tropical ulcer only 1 gave a positive result; of 8 cases of Vincent's angina 2 gave positive TPI and classical serum tests; the first was a girl of 8 with varying classical reactions and a TPI of 58 per cent.; the second was a blood donor whose TPI reactions on 2 occasions were 85 and 88 per cent., but whose serology had always been negative in the past. Both were given antisyphilitic treatment.

It is concluded that *Spirochaeta* and *Leptospira* do not give false positive TPI reactions, but in Vincent's angina the position is doubtful. *T. E. Osmond*

Wada, H. & Fujino, T. **Treatment of Experimental Rat-Bite Fever with Various Antibiotics.** *Med. J. Osaka Univ.* 1955, Mar., v. 6, No. 1, 97–106, 2 figs. [10 refs.]

The effect of 5 antibiotics, penicillin, streptomycin, aureomycin, oxytetracycline and chloramphenicol was studied in experimental rat-bite

fever in mice and guineapigs. The culture used was a strain of *Spirillum minus* isolated from house and sewer rats caught by the Kobe City Health Laboratory in 1951, and maintained by mouse passage. In experiments with mice, animals weighing 15 mgm. were infected and 2 weeks later, when spirochaetes were demonstrable in the blood by dark-ground microscopy, treatment was started. Treatment was assessed by dark-ground examination of blood and inoculation of healthy animals. Untreated mice remain lifelong carriers of the organisms in the blood stream. Adult guineapigs were infected by subcutaneous or intraperitoneal inoculation of blood from an infected mouse. Untreated animals developed a high fever from about the 12th to 13th day and most of them died in 3 to 4 weeks. Treatment was begun 2 to 3 days after the onset of fever. All antibiotics were given by intraperitoneal injection, usually in a single daily dose.

With penicillin 3 daily doses of 50 units/gm. freed the blood from spirochaetes in 6 out of 9 mice. A single dose of 500 units/gm. caused only a temporary disappearance of spirochaetes. Similarly, 3 daily doses of 50 units/gm. completely cured infected guineapigs.

Dihydrostreptomycin in 3 daily injections of 30 μgm./gm. sterilized the blood of 6 out of 9 mice and 3 doses of 50 μgm./gm. cured guineapigs. Aureomycin (aureomycin crystalline Lederle intravenous) was effective in similar doses (if figures in tables and summary, which differ from those in body of text, are correct), but oxytetracycline (Terramycin Pfizer intravenous) caused only temporary improvement, even when 200 μgm./gm. were given to mice daily for 5 days. Similarly large doses of chloramphenicol had only a slight therapeutic effect. *Mary Barber*

YAWS AND OTHER TREPONEMATOSES

Nery-Guimarães, F. **Sensibility of the Hamster** (*Cricetus auratus*) **to the** *Treponema pertenue*. *Mem. Inst. Oswaldo Cruz.* 1955, May, v. 53, No. 1, 59–65, 1 fig.

The author, from the Instituto Oswaldo Cruz, Rio de Janeiro, refers briefly to previous work on experimental yaws in hamsters [this *Bulletin*, 1953, v. 50, 775; 1955, v. 52, 644] and then describes in detail his own experiments in which local and metastatic lesions were produced in hamsters after inoculation of material from human lesions.

Eight hamsters were injected with 0·5 cc. of a saline suspension of macerated papillomatous material from a case of yaws: 4 animals were inoculated in the testicle, 2 in the scrotum and 2 in the peritoneal cavity; skin lesions developed in every case and all contained treponemes. The

lesions were clinically characteristic of yaws and this was confirmed histopathologically. The lesions appeared on the genital organs, anus, tail, muzzle, back and hind paws. The incubation periods after testicular, scrotal and peritoneal inoculation were 35, 55 and 107 days. In some cases positive subinoculation into normal hamsters was effected. No treponemes were found in the internal organs, either directly or by inoculation of normal hamsters. In the 5 cases in which Wassermann and Kahn reactions were performed the sera gave negative results, even though treponemes were present in the lesion.

In another experiment, 4 infected male hamsters were mated with 4 normal females: 2 of the normal females developed nasal lesions by direct contact. The author confirms the suitability of hamsters in the experimental study of yaws. *H. J. O'D. Burke-Gaffney*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Tarabini Castellani, G. Serología en lepra: anticuerpos antilipoideos y antitreponémicos. [**Serology in Leprosy: Antilipoid and Antitreponemal Antibodies**] *Rev. "Fontilles"*. Valencia. 1955, July, v. 3, No. 8, 572–7. [26 refs.]

Serological tests were performed on the sera of 20 leprous patients. All these sera were positive or partly positive to the Wassermann reaction and to the Meinicke, Kahn and Citochol tests. With the Pallida reaction (complement-fixation with an antigen derived from Reiter's treponema) only 2 of the sera were positive and a third was doubtful. From this it was concluded that only in those 2 sera (and doubtfully in a third) was antitreponemal antigen present, though in all of them there was antilipoid antigen. *Ernest Muir*

Contreras, Guillen, Miguel, S., Terencio & Tarabini. Tratamiento de las leprorreacciones con cortisona. [**Treatment of Lepra Reactions with Cortisone**] *Rev. "Fontilles"*. Valencia. 1955, July, v. 3, No. 8, 555–71, 16 graphs. [11 refs.]

Nine patients of the lepromatous type suffering from acute lepra reaction, and 1 similar patient who had had lepra reaction for a year which would not yield to any form of treatment, were treated with cortisone (Altesona), parenteral injections being given of a 25 mgm. per

cc. solution. Clinical notes and temperature graphs are given of all the 10 cases. In no case was a maximum aggregrate of more than 1·5 gm. exceeded, though other leprologists had given between 4 and 8 gm. With the exception of one patient with general oedema and albuminuria who had been in reaction for a year, tolerance of the treatment was perfect. Fever disappeared in 1 to 3 days, while the other symptoms of reaction disappeared more slowly, as did also the pains in the nerves and the bones. There was a feeling of physical and mental well-being soon after the beginning of treatment. The usual daily dose was 100 mgm. divided into 2 parts.

It is considered wise not to give this treatment if there is renal disease. At Fontilles, where the trials were made, the usual treatment of lepra reaction is haemotherapy, cortisone being reserved for the minority who do not yield to haemotherapy.

The uniformly good results obtained are credited to the comparatively moderate doses given. *Ernest Muir*

Blanc & Prost, M. T. Recherches cliniques sur les propriétés immunologiques et thérapeutiques de l'antigène " Marianum ". [**Clinical Research on the Immunological and Therapeutic Properties of the " Marianum " Antigen**] *Rev. Coloniale de Méd. et Chir.* 1955, Dec. 15, v. 27, No. 241, 226–36. [30 refs.]

Remarkable claims are made by the authors after using an antigen derived from a culture of *Myco. marianum* on 459 leprous patients for 2 years: they found that 6·3 per cent. showed no benefit, 20·8 per cent. remained unchanged, and in 72·9 per cent. the symptoms had regressed and there was a general condition of improvement. [No mention is made of bacteriological improvement.] Regarding the power of this antigen to make positive a negative Mitsuda reaction: 74·6 per cent. of 51 contacts with a negative Mitsuda became positive; 75·5 per cent. of 314 negative indeterminate cases became positive; and 75·7 per cent. of 107 negative lepromatous cases became positive. [This last statement is hard to credit as it differs so widely from the findings of other workers such as Chaussinand. The method of doing the Mitsuda test is not mentioned, nor the way of preparing the Mitsuda antigen. The authors do not seem to realize that if it were possible to convert 75 per cent. of Mitsuda reactions in lepromatous cases it might be a tremendous step forward in the treatment and control of leprosy. A suspicion is left however that some mistake has been made.] Convit *et al.* [this *Bulletin*, 1953, v. 50, 421] are quoted as getting conversions of the Mitsuda reaction from negative to positive in 40·7 per cent. of 113 lepromatous cases [but it is not mentioned that these 113 patients had been previously rendered bacteriologically negative by treatment with sulphone]. *Ernest Muir*

Nakamura, M. **Attempts to Approach to the Clarification of Chemical Composition of** *Mycobacterium lepraemurium*. **I. Separation of the Bacilli from the Subcutaneous Tissue of Rat infected with** *Myc. lepraemurium*, **and some Properties of the Bacilli.** *Kurume Med. J.* 1955, v. 2, No. 2, 110–16.

"Some attempts of the pure separation of Myc. lepraemurium from infected subcutaneous tissue were reported. The results obtained indicate that chloroform, toluol fractionation and Hanks' method are hopeful methods for isolation of the bacilli. Furthermore, some chemical properties of the bacterial cells of Myc. lepraemurium obtained from the chloroform fractionation were investigated. Myc. lepraemurium contains approximately the same amount of nitrogen, and contains two times as much as the amount of phosphorus of other acid fast bacilli. The concentrated bacilli obtained by chloroform fractionation are found to possess no infectivity in white rat. Amino acid contents of Myc. lepraemurium were determined as similar to those of other acid fast bacilli.

"In future, the efforts toward the isolation of more purified Myc. lepraemurium and the studies on the chemical composition of the bacilli will be continued."

HELMINTHIASIS

*In this section abstracts are arranged as far as possible in the following order:—*Trematodes *(schistosomes, other flukes);* Cestodes *(Diphyllobothrium, Taenia, Echinococcus, other cestodes);* Nematodes *(Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.).*

McCullough, F. S. **Apparent Resistance of a Snail to Infection in the Gold Coast.** [Correspondence.] *Nature*. 1955, Nov. 19, v. 176, 981–2.

An apparent resistance to infection by *Schistosoma haematobium* is described for *Bulinus* (*Pyrgophysa*) *forskali* found in the Gold Coast. Of several thousand snails of this species collected there none was found to be infected with mammalian schistosomes. *B. forskali* exposed to *S. haematobium* miracidia under a variety of experimental conditions failed to take the infection, while in two of the experiments where indigenous *Physopsis africana* or *Bulinus* sp. were concurrently exposed in the same dish the latter species proved susceptible. The problem of susceptibility and resistance is discussed with reference to the fact that *B. forskali* found in the Gambia and in Mauritius has proved susceptible to infection by *S. haematobium*. It may be that knowledge of the taxonomy and biology of the snail is insufficient to determine the differences between these territorial strains or "species" or that the observed variation is

due to strains of *S. haematobium* specific to certain hosts and present in the Gambia and Mauritius but absent in the Gold Coast. Such speculation is being put to the test by exposure of *B. forskali* to *S. haematobium* miracidia from many districts of the Gold Coast. At present there is no evidence that *B. forskali* is a vector of *S. haematobium* in the Gold Coast. *O. D. Standen*

Wright, C. A. *Bulinus* (*Pyrgophysa*) *forskalii* **(Ehrenberg) as a Vector of** *Schistosoma haematobium*. [Correspondence.] *Nature*. 1956, Jan. 7, v. 177, 43.

Wright, from the British Museum (Natural History), challenges the statements made by McCullough [above] that *Bulinus* (*Pyrgophysa*) *forskali* was known to be a vector of *S. haematobium* in the Gambia and Mauritius. While *B. forskali* is found in the Gambia the vector identified as this species by McCullough and Duke [this *Bulletin*, 1955, v. 52, 169] has in fact been identified as *B. senegalensis* Müller by Mandahl-Barth or, tentatively, as *B. ludovicianus* by Wright. [In their original paper McCullough and Duke regarded *B. senegalensis* as being closely allied to, if not identical with, *B. forskali*.] Further, the evidence that the Mauritius vector, described by Adams [*ibid.*, 1934, v. 31, 774] and by Cowper [*ibid.*, 1954, v. 51, 496] is *B. forskali* is based on inaccurate identification: this species is, in fact, *B. cernicus*. When these differences of opinion can be resolved by further taxonomic studies the exact identity of the Gambian vector will be established, but there can be no reasonable doubt that *B. forskali* is not the important vector in the Gambia. *O. D. Standen*

Wajdi, N. **A Quantitative Survey of** *Bulinus* **Snails in the Winter Season.** *Bull. Endem. Dis.* Baghdad. 1955, July, v. 1, No. 3, 257–64, 2 figs.

The number of snails collected in canals in central and southern Iraq increased gradually between December and February and rose suddenly in March.

Piganiol, G., Hervé, A., Chartres, A. & Guilbaud. Les aspects cliniques de la bilharziose urinaire, d'après 50 observations. [**Clinical Aspects of Urinary Schistosomiasis based on 50 Cases**] *Méd. Trop.* Marseilles. 1955, Sept.–Oct., v. 15, No. 5, 519–35, 15 figs. (12 coloured) on 4 pls.

Schistosomiasis due to *Schistosoma haematobium* is now known to be widespread in French African territories. Some 50 typical cases have

been investigated at a urological clinic in Marseilles in a single year. This paper gives an account of the findings in these cases; it directs attention to the difficulties of clinical diagnosis and the importance of specific diagnosis in all possible cases coming from areas where the condition is endemic. Antimony treatment is effective in the early stages, and is given in the form of anthiomaline as tartar emetic is so toxic. Treatment of the advanced disease, with its complications, is much less satisfactory. *A. R. D. Adams*

Milne, I. R. & Darling, W. J. E. **A Case of Haematemesis of Bilharzial Origin.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 574–6.

A European girl of 4½ years in Salisbury, S. Rhodesia, was unwell for a week, got worse and vomited, and the following day had haematemesis. She was admitted to hospital acutely ill with a tense, tender and much enlarged liver, a palpable spleen, and some fever. The clinical diagnosis was rupture of oesophageal varices following portal congestion. The urine was then found to contain many *Schistosoma haematobium* eggs, and pus and blood; a cercarial skin test was positive. There was no history of a rash or allergic episode, and there was no eosinophilia. Treatment with anthiomaline was promptly started, and within a week there was marked clinical improvement with diminution in the liver and spleen sizes. Six weeks after the beginning of treatment there were no symptoms and no physical signs; examination of stools and of urine then also revealed no abnormalities.

Enquiry showed the probable source of infection to be a pool 30 miles away where the family had camped 5 or 6 months earlier. Examination showed 2 of the 3 other children of the family to be similarly infected. *A. R. D. Adams*

Caubet, P., Miletto, G., Ruzié, J. & Boubé, G. Aspects médicaux des bilharzioses viscérales disséminées (à propos de deux observations). [**Two Cases of "Disseminated" Urinary Schistosomiasis**] *Méd. Trop.* Marseilles. 1955, July–Aug., v. 15, No. 4, 430–36, 3 figs.

Schistosomiasis may cause symptoms and signs simulating other conditions. This is a record of 2 cases of schistosomiasis in adults which illustrate this. The first was a young woman who developed epileptiform seizures, haemoptyses, severe epigastric pain, and transient glycosuria on repatriation from the "Far East". Cystoscopy revealed typical schistosomal lesions [though there is no record of eggs being recovered]. The second patient was a young man, also repatriated from the "Far

East '', with diabetes, pulmonary tuberculosis, albuminuria, neurological abnormalities, and a slightly enlarged spleen. Cystoscopy here again showed typical schistosomal lesions [but once more there is no record of the recovery of ova]. Radiography showed calcified foci in the pancreas.

In each case the authors believe that schistosomiasis accounted for most of the symptoms and signs, which were due to the lodgment of the eggs in various organs and viscera. *A. R. D. Adams*

Sharaf el Din, H. & el Nagar, H. **Control of Snails by Copper Sulphate in the Canals of the Gezira Irrigated Area of the Sudan.** *J. Trop. Med. & Hyg.* 1955, Nov., v. 58, No. 11, 260–63, 1 map & 1 diagram.

This article reports the results of experiments with a new technique of snail control by copper sulphate in the Gezira irrigation canals. Sulphation by ordinary methods is only effective for 2 to 3 months as a result of failure to destroy snail eggs or reinfestation from upstream. Working on the latter alternative, a small-scale experiment was made. Two heavily infested minor canals, after weeding and treatment with copper sulphate at 30 parts per million, were proved to be free of snails. One of the canals was kept as a control and across the intake of the other a chemical barrier of copper sulphate was installed by suspending at regular intervals bags containing sufficient of the chemical to maintain for 24 hours in the water a concentration of 0·5 part per million. Surveys were then made weekly for 10 months and it was found that whereas the control canal was re-infested in the third month no snails could be found in the barrier-treated canal. A large-scale experiment was then undertaken.

A system of minor canals, of a total length of 75 km. and with a common intake, was freed of snails by weeding and sulphation and a chemical barrier was installed close to the intake at a point where the current was sluggish and contact between the snails and molluscicide was therefore lengthened. The discharge into the canal system was 165,000 cubic metres per 24 hours and the concentration of copper sulphate applied was 0·125 part per million at maximum flow. Over a period of 16 months a few snails only were found in one sheltered spot on a single occasion. It was also noted that the growth of aquatic weed was greatly reduced by this treatment. These observations were confirmed by consultants from WHO. It is maintained by the authors that copper sulphate is cheaper and easier of application than sodium pentachlorophenate in canal systems.

[This article records an important advance in the control of schistosome vectors in irrigation canals by means of copper sulphate. On the figures given the amount of the chemical required to produce a concentration of 30 parts per million four times a year is 2·6 times greater than

that needed to maintain a continuous daily concentration of 0·125 part per million.] *T. H. Davey*

Kuntz, R. E. & Malakatis, G. M. **Susceptibility Studies in Schistosomiasis. IV. Susceptibility of Wild Mammals to Infection by *Schistosoma haematobium* in Egypt, with Emphasis on Rodents.** *J. Parasitology.* 1955, Oct., v. 41, No. 5, 467–75.

Mammalian host-susceptibility to *Schistosoma haematobium* is little known because of the difficulties associated with maintenance of this species in the laboratory. These workers exposed a total of 278 mammals (9 species of rodents, an insectivore and 3 species of carnivore) to cercariae of *S. haematobium* obtained from naturally infected *Bulinus truncatus* from the irrigation system near Cairo. All animals were exposed to infection by the percutaneous route. The results showed that a number of species became infected but that rodents were the most susceptible. The hedgehog (*Hemiechinus auritus aegyptius*) proved to be a fair host while the carnivores (*Mustela nivalis subpalmata*, Egyptian weasel; *Herpestes i. ichneumon*, Egyptian mongoose; *Vulpes v. aegyptiaca*, Egyptian fox) were non-susceptible. Of the rodents, the Nile rat (*Arvicanthis niloticus*) continued to pass viable eggs in the faeces for up to 3 years. This species also produced a few viable eggs in the urine. Eggs were first apparent in the liver 8 weeks after infection and abundant eggs were found later in the walls of the large intestine. Egg output declined as the infection aged. The Nile rat was considered to be the most suitable laboratory host for *S. haematobium*. [For previous parts of this study, see this *Bulletin*, 1955, v. 52, 798, 799.]

O. D. Standen

Lôbo, A. G. S., Luz, E. & da Gama e S., R., Jr. Inquérito preliminar sôbre planorbídeos realizado na Cidade de Jacarèzinho, Paraná. [**Preliminary Study on Planorbids in the City of Jacarèzinho, Paraná**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Oct., v. 6, No. 4, 541–4, 1 map & 4 figs.

Jacarèzinho was the location of the first focus of *S. mansoni* schistosomiasis recorded in the State of Paraná, Brazil [this *Bulletin*, 1949, v. 46, 1058].

As a result of a survey of snails, their breeding places and infectivity, the authors have now identified 5 species, namely *Australorbis glabratus olivaceus* (1,568 specimens), *Tropicorbis centimetralis* (316), *Drepanotrema cultratum* (175), *A. bahiensis* (77) and *Gyraulus schubarti* (3). The principal breeding places were tributaries of the rivers Ourinhos and Água Feia, and areas in their neighbourhood. *A. glabratus olivaceus* was the predominant species (73·31 per cent.) and was the only one found

to be infected by *S. mansoni*; 10 out of 1,387 of these snails (0·72 per cent.) were infected. *H. J. O'D. Burke-Gaffney*

Lôbo, A. G. S. & Luz, E. Contribuição ao conhecimento da distribuição geográfica dos planorbídeos no Estado do Paraná. [**Geographical Distribution of Planorbids in the State of Paraná**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, Oct., v. 6, No. 4, 545–54, 1 map & 7 figs.

In 24 towns in 28 areas in Paraná, 6 species of planorbids were found, *viz.*, *A. glabratus olivaceus*, *A. bahiensis*, *A. tenagophilus*, *Tropicorbis centimetralis*, *Drepanotrema cultratum* and *Gyraulus schubarti*. *D. cultratum* was found in more areas [20] than the others [2 to 12]. The results are shown in a table and a map and the species of snails are illustrated by photographs. *H. J. O'D. Burke-Gaffney*

Lôbo, A. G. S., Luz, E. & Consolin, J. Novos focos de esquistossomose mansônica no Estado do Paraná. [**New Foci of** *S. mansoni* **Infection in the State of Paraná**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, Oct., v. 6, No. 4, 555–65, 5 maps.

In 4 cities in the State of Paraná, Brazil, the authors examined several stools of members of the population and surveyed the snail fauna for *S. mansoni* infection. The results were as follows:

	Faeces positive for *S. mansoni*	Natural Infection of *A. glabratus olivaceus*
Santo Antônio da Platina ...	1·23%	0·04%
Monte Real	11·40%	0·76%
Cia. Agrícola Usina Jacarèzinho	7·96%	0·27%
Maticanã	12·79%	3·06%

H. J. O'D. Burke-Gaffney

Newton, W. L. **The Establishment of a Strain of** *Australorbis glabratus* **which combines Albinism and High Susceptibility to Infection with** *Schistosoma mansoni*. *J. Parasitology*. 1955, Oct., v. 41, No. 5, 526–8, 1 fig.

A Brazilian albino strain of *Australorbis glabratus*, non-susceptible to a Puerto Rican strain of *S. mansoni*, was crossed with a highly susceptible pigmented Puerto Rican *A. glabratus*. The pigmented F_1 generation (albinism being recessive) was segregated at 1 to 1·5 mm. diameter and reproduction through self-fertilization only was permitted. Offspring of this self-fertilization were similarly segregated and bred through 10

successive generations of self-fertilization. The parent of the 4th generation was selected for susceptibility and those of the 5th and 6th generations for both albinism and susceptibility. From the 6th generation onwards all snails were albinos and no check was made for suceptibility. The final strain was isolated from the 10th generation and a colony established 3 years after the initial cross. Snails of this colony were tested for susceptibility when at 8–10 mm. diameter by exposure to 10 miracidia each. Almost 100 per cent. of snails surviving the developmental period discharged cercariae. A susceptible albino strain had thus been produced.

A sporocyst of *S. mansoni* was observed directly in the mantle of a living albino snail and it is suggested that the transparency associated with this strain might prove valuable in the study, *in vivo*, of the development of the parasite or the actions of molluscicides. This is illustrated in a photomicrograph. *O. D. Standen*

Haddock-Suarez, J. & Rodriguez-Molina, R. **Schistosomiasis mansoni —the Acute Phase—Report of a Case.** *Bol. Asoc. Med. de Puerto Rico.* 1955, Nov., v. 47, No. 11, 441–9.

Gönnert, R. Schistosomiasis—Studien. I. Beiträge zur Anatomie und Histologie von *Schistosoma mansoni.* [**Studies on Schistosomiasis. I. Anatomy and Histology of** *Schistosomiasis mansoni*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Apr., v. 6, No. 1, 18–33, 11 figs. [Numerous refs.] II. Über die Eibildung bei *Schistosoma mansoni* und das Schicksal der Eier im Wirtsorganismus. [**II. Ovulation in** *S. mansoni* **and the Fate of the Egg in the Host Tissues**] *Ibid.*, 33–52, 6 figs. [Numerous refs.] III. Über die Einwirkungen von Miracil D auf *Schistosoma mansoni* im Mäuseversuch und die Verteilung des Pigmentes in der Wirtsleber. [**III. Action of Miracil D on** *S. mansoni* **in Experiments in Mice and the Distribution of Pigment in the Host's Liver**] *Ibid.*, Oct., No. 3, 257–79, 9 figs. [Numerous refs.] IV. Zur Pathologie der Schistosomiasis der Maus. [**IV. Pathology of Schistosomiasis in Mice**] *Ibid.*, 279–336, 9 figs. [Numerous refs.]

The English summaries appended to the papers are as follows:—

I. "Extensive anatomical and histological studies of S. mansoni have enabled the findings of Looss to be completed and supplemented.

"Electron-microscopic examination of the cuticle has given further information on the complexity of its structure, and confirmed the homogeneity of the spines previously shown by photomicroscopy. Moreover, this has led to the assumption that the basal membrane of the cuticle also is split to circumscribe the spine.

" Detailed description is given of the female reproductive apparatus, and the function and the significance of its various parts.

" Of the new findings the following are worthy of mentioning, the haploidy of yolk cells and the occurrence of oocytes in the posterior part of the oviduct of regenerating females. This confirms the hypothesis that the ovary and the yolk glands have phylogenetically the same origin.

" The epithelial cells of the ootype were shown to be apocrine serous glandular cells with a rhythmic function connected with the formation of ova.

" The function of Mehlis' glandular cells which produce a mucous secretion, appears to have no direct connection with the formation of ova.

" The Mehlis' glands open into the ante-chamber of the ootype, their orifices penetrate the epithelial cells."

II. " The origin and the formation of the egg, with special reference to the shell, have been studied. The latter is formed in the ootype from the granules which are contained in the yolk cells, and which, apparently under the influence of the secretion of the ootype epithelial cells, unite to a homogenous shell. The maturation process and the structure of the egg-shell consisting of quinone tanned protein, are described.

" The lateral spine of the S. mansoni-egg as well as the spine of other schistosome species is of no importance for its tissue passage, but probably has an assisting function during the passive transport of the egg towards the bloodstream in the fine capillaries.

" The eggs not excreted die in the host's body after 3 to 4 weeks at the latest. The maximum duration of life of the eggs in the tissue is about one week longer, which is the time of the embryonic development. The further fate of the eggs in the tissue (maceration of the miracidium and its absorption, phagocytosis, and absorption of the egg-shell) is described, and the duration of the single stages determined. The data are based on histological studies of mice livers which were examined at various times after infection and following treatment."

III. " During or after the effective treatment, the schistosomes leave the mesenteric vessels and are carried with the bloodstream into the liver. The coupled worms separate. An alteration of their normal physiological function is evidenced by a diminution of the content of their intestine, in the distribution of their intestinal pigment, and in an alteration in the production of the germ cells and in the production of eggs.

" According to the strain of mice used, the parasites die within a period of 1–2 weeks after Miracil D treatment has been started. In the damaged schistosomes can be seen a marked opacity of the worm body extending from the tail to the head.

" The first histological signs of degeneration and death are seen in a vacuolisation of the cuticle. After the probable enzymatic degradation of the cuticle, eosinophils and macrophages penetrate the parasites. The

absorption of the parasite tissues lasts from 2 months to a year or more according to their location in the liver. The female worm, which is poorer in tissue-substance than the male, is absorbed much more quickly and completely than the male. The absorption of the connective tissue takes place very slowly so that from old granulomas around dead worms it is often easy to determine the sex of the parasite. Frequently in old worm-granulomas, eosinophilic plate or needle-shaped crystals are seen, which are probably granules from the eosinophils which have joined together.

" The regeneration of the markedly damaged schistosome has also been studied. The males recover rapidly, whilst the females in some cases have an immature appearance for many months. If the mother cells of the germ cells were not destroyed by the treatment (sterilisation of the worm) then regeneration of the germ epithelium and renewal of the sperm production, oogenesis and yolk glands occur. The production of eggs then may begin again after a fresh pairing of the parasites.

" The schistosome pigment is at first stored by the Kupffer cells of the liver, and then laid down in the periportal region, and there phagocytosed by foreign body giant cells. The distribution of the pigment in the liver at different stages of the infection either if it ran their normal course, or after treatment with Miracil D, was studied. The quantity and distribution of the pigment in the Kupffer cells and in the whole liver, allow important conclusions to be made regarding the degree of damage of the parasites caused by the treatment."

IV. " The pathology and pathogenesis of liver damage in the mouse occurring during the course of a normal untreated infection are investigated. Further, the regeneration of the liver after successful treatment of the infection has been studied. The main object of the investigation was to analyse the factors which are determinative for the pathology in the liver.

" The macroscopically observable alterations in the liver are as follows: (1) grey to reddish-black discoloration due to the schistosome pigment; (2) infarcts due to eggs, and (3) granulomas which have formed around eggs and dead parasites, leading to more or less extensive increase of connective tissue.

" The histological studies were concerned with the tissue-reactions caused by the toxic metabolic products, the break-down of the parasite and its eggs. Permanent damage or change which reverses only slowly is seen especially in the increased connective tissue and the granulomas around the dead parasites and eggs. In the mouse liver, which is poor in connective tissue, fibrosis is relatively of a mild degree.

" The different phases in the formation and regression of the granulomas around parasites and eggs were thoroughly studied. Some of the factors concerned in the development of the granulomas were analysed.

" The investigation of the development of the pseudo-tubercle permits

conclusions to be drawn concerning the penetration of tissue by the ova. Toxic and enzymatic substances which diffuse through the eggshell, are mainly responsible for this tissue-penetration.

" The changes in the biliary system are of special interest. They can lead to biliary tract hyperplasies similar to adenomatous growths. The epithelial cells of the biliary tract may be changed into different forms of glandular cells. This occurs chiefly in the hyperergic phase of the infection and after effective treatment. The investigations on the biliary tract are also a contribution to the general morphology and function of the cell.

" The heavy damages made by the infection on the liver parenchyma is seen in circumscribed and disseminated necrosis and in an alteration of the nuclear structure of the parenchymal cell. Such are, nuclear oedema, appearance of macronuclei, inclusion-like structures in the nuclei and endomitotic polyploidisation. When the stimulus has ceased, these changes slowly regress and the normal structure of the liver returns. These studies on the liver parenchyma are also of interest in connection with regulative changes, that occur when the nucleus is subject to a lengthening irritation, and to an imbalanced relation of plasma and nucleus.

" Serious infections can cause liver disfunctions, which resemble various forms of human liver cirrhosis. In such cases the liver-structure can be markedly deranged by the subcapsular parasite granulomas and the confluent widespread pseudotubercles. After cure of the infection, extensive regeneration occurs in the liver leading to a normalisation of their structure and regression of granulomas.

" The analysis of some of the factors, which are important for the pathogenesis of liver changes has also made a contribution to the study of the relationship of host and parasite. In this connection the complicated mutual influence of host and parasite has been confirmed, and the necessity of considering both as a biological and functional unit is obvious."

Berrios-Duran, L. A. **An Efficient Device for exposing Mice to Schistosome Cercariae and holding Small Animals for Post Mortem Examination.** [Research Notes.] *J. Parasitology.* 1955, Dec., v. 41, No. 6, 641–2, 3 figs.

Fain, A. Un nouveau Schistosome du Cormoran au Ruanda-Urundi (Congo Belge). *Ornithobilharzia baeri* n.sp. [Miscellanea.] [**A New Schistosome, *Ornithobilharzia baeri*, in the Cormorant in Ruanda-Urundi, Belgian Congo**] *Acta Tropica.* Basle. 1955, v. 12, No. 4, 356–60, 7 figs.

Dardel, G. A proposito de la Equinococosis alveolaris en el Uruguay. [*Echinococcus alveolaris* **in Uruguay**] *Archivos Uruguayos de Med., Cirug. y Especialidades.* 1955, Jan.–Feb.–Mar., v. 46, Nos. 1, 2 & 3, 25–32.

Anastasio, J. V. & Peraita, P. Equinococosis encefalica. [**Encephalitic Echinococcal Lesions**] *Cirugia.* Madrid. 1955, July–Sept., v. 2, No. 5, 31–42, 10 figs. [12 refs.]

The English summary appended to the paper is as follows:—

"Seven cases of intracraneal hydatidic cysts of different localizations are analyzed, dwelling upon the physiopathological problems that the hydatidic cyst presents from the neurosurgical point of view.

"In the same way considerations are made on purpose of this surgical treatment, as the only possible means of treating these lesions.

"Literature is being revised regarding this problem."

di Bello, R. & Menéndez, H. El injerto hidático del pericardio. [**Hydatid Involvement of the Pericardium**] *Archivos Uruguayos de Med., Cirug. y Especialidades.* 1955, Apr.–May–June, v. 46, Nos. 4, 5 & 6, 167–203. [74 refs.] English summary.

A review and discussion of 53 cases in the literature.

Sato, G. [**Process of Decomposition of the Dead Bodies of Ascarides in the Bile Duct: Experimental Formation of so-called Round Worm Gallstones**] *Hirosaki Med. J.* 1955, v. 6, No. 3, 194–212, 15 figs. [12 refs.] [In Japanese.] English summary *46–*47.

The author enclosed dead ascarids in the gallbladder of a dog and found that decomposition (which in saline at 37°C. was complete in 10 days) was greatly delayed and advanced very little at this time. A week after enclosure, the worms decreased greatly in size and became flat, owing no doubt to dehydration resulting from the difference in osmotic pressure between the body fluid of the ascarids and the bile.

After a month, the internal structures of the worms were almost completely decomposed but the cuticle remained intact. During the month in which this decomposition was taking place, half of the enclosed worms became encrusted with calcium carbonate. Thereafter this process ceased and later the encrustation disappeared: it probably resulted from the formation of ammonium carbonate caused by decomposition of albumin in the body of the worms.

During decomposition, the *p*H of the bile tended to be alkaline, but when decomposition ceased it became more acid.

In the first few days of enclosure, very slight encrustation of the viscera with calcium bilirubinate occurred: this encrustation included the

cuticle 4 weeks later and increased vigorously by the sixth week, that is, about the time when the calcium carbonate encrustation began to disappear. After 10 to 12 months the author found 3 ascarids completely converted into gallstones. He also noted that the ascarid bodies continued to decompose even when they were completely covered by calcium bilirubinate, but the cortical layer of the cuticle retained its characteristic structural features for a considerable time. *H. J. O'D. Burke-Gaffney*

Semenova, N. E., Turchins, M. E. & Krotov, A. I. [**Treatment of Cases of Enterobiasis and Ascariasis with Piperazine**] *Med. Parasit. & Parasitic Dis.* Moscow. 1955, v. 24, No. 4, 298–300. [11 refs.] [In Russian.]

The authors describe the results of treatment of human ascariasis and enterobiasis with a Soviet preparation of piperazine adipate. In the case of ascariasis, complete cure was obtained after treatment with doses of 1 gm. administered twice daily for 2–3 days in succession. In the case of enterobiasis, the dosage was similar but the best results were obtained after 2–3 courses of treatment with intervals of 3–5 days between them.

Treatment with piperazine was followed by an elimination of the clinical symptoms and marked improvement in the health of the patients. The only side-effects noted in a few cases were slight nausea, salivation and " heartburn ". *C. A. Hoare*

Smith, A. **The Transmission of Bancroftial Filariasis on Ukara Island, Tanganyika. I.—A Geographical and Ecological Description of the Island with an Annotated List of Mosquitos and other Arthropods of Medical Importance.** *Bull. Entom. Res.* 1955, Aug., v. 46, Pt. 2, 419–36, 4 figs. on pl. & 1 text fig. **II.—The Distribution of Bancroftial Microfilaraemia compared with the Distribution of Hut-Haunting Mosquitos and their Breeding Places.** *Ibid.*, 437–44, 6 figs. on pl. & 1 text fig. [13 refs.] **III.—Biting-Incidences on Man and Filarial Infections in Wild-Caught Mosquitos.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 495–504. **IV.—Host-Preferences of Mosquitos and the Incrimination of** *Anopheles gambiae* **Giles and** *A. funestus* **Giles as Vectors of Bancroftial Filariasis.** *Bull. Entom. Res.* 1955, Oct., v. 46, Pt. 3, 505–15.

I. Ukara Island lies in the south-east area of Lake Victoria. It is roughly square and 45 square miles in area. The lake itself is 3,750 ft. above sea level and the highest ridge of the island is only 800 feet above lake level. The central grasslands, deeply eroded to gullies, are unpopulated; intensive cultivation is practised in the coastal zone. A map shows the main topographical features, particularly the seasonal streams and rivers, the principal villages and the limits of the 13 districts. The average annual rainfall is about 60 inches, spread over the short rains (November and December) and the long rains (March to May);

temperature is equable with monthly means ranging between 67°F. minimum and 83°F. maximum; wind speeds (at noon) range from 2·4 to 4·8 metres per second.

The soil is acid and rather poor in organic matter, calcium, and phosphorus. Advanced agricultural methods are practised, such as mixed cropping with nitrogenous plants, thorough digging, terracing and other means of conserving soil and water, besides intelligent use of irrigation. The island is thereby able to support a population of 17,000 inhabitants, almost exclusively African, 13,000 cattle and 8,000 goats. The animals are mainly kept indoors, fed and bedded on gathered grasses, and they yield a valuable amount of manure for the arable land.

Most of the villages are among trees in the coastal belt; the trees are pollarded to give canes for hut construction. Most huts are cone-shaped, of wattle and thatch, and 20 ft. in diameter. Man, cattle and other domestic animals often share the same hut. Chief food crops are bulrush millet and cassava with some sweet potatoes, groundnuts and sorghum. Rice is a cash crop.

A list is given of 3 amphibia, 11 reptiles, and 10 mammals (other than domestic animals) taken on the island and of the type of environment they frequent. The mammals comprise 4 species of bat, 3 species of rodent (including *Rattus rattus*), hedgehog, marsh mongoose, bush genet, and the rock-rabbit (*Heterohyrax*). The extensive avifauna could not reasonably be studied in the present work.

Mosquito species and varieties number 13 anophelines, and nearly 30 culicines. There are brief notes on their biting, resting, and breeding habits, and their relative abundance in season. About 2,000 blood meals were analysed by precipitin test to provide the data on hosts, which are recorded for several species.

Musca domestica and *Stomoxys calcitrans* probably breed in stacks of drying cattle manure removed from huts. *Chrysomyia* spp. occur at pit latrines. *Tabanus taeniola* and *Chrysops distinctipennis* bite man but the numbers reported are negligible. Other arthropods include *Cimex hemipterus*, *Tunga* and *Echidnophaga*; about 2 per cent. of 239 persons were louse-infested (*Pediculus humanus capitis* only); cockroaches, scorpions and *Amblyomma variegatum* (sometimes in the huts) were seen and *Ornithodorus moubata* was found in 18 per cent. of the 123 huts examined. Dispensary records give a 1 per cent. infection rate with relapsing fever.

II. This paper opens with a summary of past literature on vectors of *Wuchereria bancrofti* in Africa. *Anopheles gambiae* (and *melas*) and *A. funestus* are most consistently implicated; there is also evidence of some degree of complete filarial development in, and transmission in nature by, *Culex pipiens fatigans*. Infective larvae have developed in *Anopheles rhodesiensis*, *A. squamosus* and *Aëdes aegypti* experimentally. Thoracic stages of a filarioid worm are known in wild-caught *A.*

pharoensis, *A. squamosus* and *Taeniorhynchus africanus*; also "infections" in *A. coustani* var. *tenebrosus*. The author notes the criteria to be satisfied before incriminating a species as a vector, and in his own studies, reported in this and the following papers, considers the facts for Ukara.

In 26 villages of Ukara examined for infections of microfilariae of *W. bancrofti* in man, the incidence varied from 6·6 per cent. to 30–40 per cent. of the inhabitants. *Dipetalonema perstans* was found in only 1 out of the 6,000 night bloods examined and the person had lived some years in a *perstans*-infected area elsewhere; loiasis was not seen. Microfilariae of filarioid worms were found in 4 species of birds, lizards (12 of 65 *Agama atricollis*), 1 of 17 dogs, and the rock-rabbits *Heterohyrax syriacus diesneri* (16 of 28 examined) but not in 110 cattle, 120 goats, 102 frogs, and smaller numbers of monitor lizards and 7 of the wild mammals of the island.

In view of these non-human filarioid infections, a first assessment of the probable vectors of human bancroftian infection was made by comparing the distribution of the disease in man with the distribution and density of house-haunting mosquitoes. Space-spraying in May and July of 240 huts representative of 24 villages yielded catches totalling about 55,000 mosquitoes, only about 3,000 being taken in July—in the long dry season. The majority (about 54,000) were *A. gambiae* which predominated in both the rains (May) and the dry season month (July). Next in abundance, but only totalling under 1,000 specimens, was *A. funestus*. Females of this species were most numerous in July. Much smaller numbers (some negligible) occurred of *Culex univittatus* and its variety *neavei*, the *C. annulioris* group, *C. duttoni*, *C. antennatus*, *C. decens*, *Taeniorhynchus africanus*, *T. uniformis*, *Aëdes africanus*, and *Anopheles pharoensis*, *A. longipalpis*, *A. rufipes*, and *A. maculipalpis*.

A table compares for 14 villages the percentage incidence of bancroftian microfilaraemia in man with wet- and dry-season catches of *A. gambiae* and *A. funestus* in the village huts. There is some indication of greater mosquito densities being associated with the higher incidences of microfilaraemia. Villages with high incidences (up to 30 per cent.) are generally at and near the main irrigated areas; these provide the most suitable conditions for the breeding of *A. gambiae* and *A. funestus*. The converse applies to villages with low microfilarial incidence. Some exceptions to these general statements seem explicable on consideration of local detail.

III. This paper considers filarial infections in wild-caught mosquitoes. First, it is shown from catches of mosquitoes coming to bite man indoors and a little way from huts, that *A. gambiae* and *A. funestus* are the species biting most frequently at night. They predominate particularly as the biting species indoors. Sleeping customs indicate that persons between 6 and 16 years old suffer most bites per night.

Day-biting species outdoors include several *Aëdes* (*africanus*, *apicoargenteus*, *aegypti* and *vittatus*). The first two species are most commonly concerned. *Taeniorhynchus uniformis* and *T. africanus*, *Culex univittatus*, *C. annulioris*, *Anopheles coustani* and *A. funestus* were found biting on a few occasions. Most of the day-biting species have little opportunity to bite as for a greater part of the day the people do not frequent the neighbourhood of the trees and bushes where the mosquitoes occur. In the daytime there is a low level of biting activity by *A. gambiae* and *A. funestus* indoors.

Circumstantial evidence for the vectors of *W. bancrofti* thus incriminates *A. gambiae* and *A. funestus*. Dissections of these species, and *A. pharoensis*, resting in huts, and other species coming to human bait outdoors, revealed infective filarial larvae only in *A. gambiae* and *A. funestus* (0·6 per cent. and 1·0 per cent., respectively). Immature filarial worms were found in *A. pharoensis*, *T. africanus*, *T. uniformis* and *C. antennatus*. It is thought that *A. pharoensis* does not survive long enough to allow complete filarial development; early death of filarial worms occurs in the species of *Taeniorhynchus*. These findings support the conclusion that *A. gambiae* and *A. funestus* are the vectors of bancroftian filariasis on Ukara island.

IV. This final paper of the series examines the host-preferences of mosquitoes at rest in huts and those resting outdoors. By precipitin tests and examination for nucleated corpuscles it was found that in huts goat, dog, and fowl were never (or not frequently) hosts for *A. gambiae*, *A. funestus*, *A. pharoensis*, *C. annulioris*, *C. univittatus*, *T. africanus* and *T. uniformis*. *A. gambiae* and *A. funestus* feed almost entirely on man and *A. pharoensis* prefers man to cattle. The culicines fed more on cattle than on man. *A. gambiae* and *C. annulioris* do, however, feed readily on fowls if man and cattle are absent from a hut.

Outdoor resting places searched for mosquitoes were caves and the vegetation at the bases of rocks. *Anopheles rhodesiensis* and *C. univittatus* were the commonest species in caves, the latter occurring also in the rock vegetation in great numbers from May to August. *T. africanus* replaced *C. univittatus* in abundance in this vegetation in November and December. A few *A. gambiae* and *A. funestus* occurred in the caves and small numbers of about 9 other species in both sites. Of 68 gorged *A. rhodesiensis* taken in caves, 66 were positive for rock-rabbit (*Heterohyrax*); a single gorged *A. gambiae* had fed on man. As regards other species from one or both of these outdoor resting places *C. univittatus* was found to have fed on man, ox, dog, rock-rabbit and fowl. *Taeniorhynchus* had fed on man, ox, dog, goat, fowl, and rock-rabbit. Some facts are given for *C. annulioris*, *C. antennatus*, and *C. poicilipes*. The numerous negative results for some of these species indicate the existence of hosts other than those tested for.

Specimens at rest in artificial outdoor pits included *A. gambiae* and *A. funestus* besides other anophelines, and some culicine species and

tests showed that most of the *gambiae* had fed on man and either man or ox was the source of the blood in at least some of the females of the other species.

In the laboratory, the facility with which different species of mosquito may feed on different hosts was observed by inserting various hosts into cages of mosquitoes. A table gives details of the hosts tried—they are representative of the smaller animal life of the island—and the several anopheline and culicine mosquitoes were given the opportunity to feed on them. *A. gambiae* and several culicine species are shown to be at least capable of feeding, if need be, on a wide range of hosts.

In a concluding section, *A. gambiae* and *A. funestus* are accepted as the chief, if not sole, vectors of bancroftian filariasis of man on Ukara. *A. rhodesiensis* is, on the evidence available, the most probable vector of the filarioid infection of *Heterohyrax* which is found in 57 per cent. of these animals. *C. univittatus* is suspect as a vector of a filarioid infection in the lizard, *Agama atricollis*. *D. S. Bertram*

Rachou, R. G. Variação diária da microfilaremia de *Wuchereria bancrofti* em 27 portadores observados durante vinte e oito dias seguidos. [**Daily Variation in Microfilaraemia due to** *Wuchereria bancrofti* **in 27 Infected Persons observed for 28 Consecutive Days**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, Oct., v. 6, No. 4, 505–17, 5 graphs. English summary.

The author studied microfilaraemia due to *Wuchereria bancrofti* in 27 infected persons in Florianópolis and Ponta Grossa, Santa Catarina, Brazil, for 28 consecutive days. One of the objects of the study was to determine whether the microfilaraemia was related to the moon's phases: no such relationship was observed.

From each person 20 cmm. of blood was taken each night between 7 and 11 p.m. Of the 756 drops examined, 607 (80·3 per cent.) were positive. The results are shown in several tables and graphs. The principal findings were as follows.

There was considerable daily variation in the microfilaria rate (63 to 88·9 per cent.) and in the average microfilaria count (15·5 to 30·0).

There was a direct correlation between the microfilaria rate and the density of microfilariae, so that negative findings were common where the density was low. The author concludes that in blood surveys for filariasis due to *W. bancrofti*, a number of individual positive cases are missed when the general incidence is low. *H. J. O'D. Burke-Gaffney*

Markell, E. K. & Kerrest, J. **Treatment of Elephantiasis with Cortisone in French Oceania.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 930–39, 3 text figs. & 3 figs. on pl.

From the results obtained in 8 patients with advanced elephantiasis in the Filariasis Clinic at the Institut de Recherches Médicales in Tahiti,

the authors, as the result of minute and sustained observations, have concluded that cortisone is of definite benefit. This is apparently effected through the anti-inflammatory action of the drug, reducing lymphatic blockage and thus promoting better lymphatic drainage. In most cases bandage therapy either of the conventional type, or with the addition of Unna's paste, has the additional advantage of softening and markedly reducing the verruciform skin changes in advanced cases. The period of treatment varied from 7 to 10 months. Re-treatment with smaller doses of cortisone for short periods, after relapse, appeared beneficial. The response of one patient could not be assessed owing to complicating arteriosclerosis. The other failure was in one with verrucose skin changes involving penis and scrotum. In one patient with microfilaraemia prior to treatment, the number of microfilariae increased markedly during treatment, then diminished again as induration reappeared.

Biopsies before and after treatment showed that no effect had been produced upon the elephantoid tissues. The diuresis and the increased microfilaraemia suggest that the action of cortisone is to reduce the inflammatory blockage of the lymphatics. The duration of the clinical response in 6 was most gratifying. Although induration usually reappeared or increased shortly after cessation of treatment, in one this did not occur until a lapse of 2 months. Initial treatment with cortisone was 100 mgm. daily in divided doses over a period of 30 days or longer. Dosage was lowered stepwise over several days before discontinuance.

The paper is illustrated with graphs detailing regular measurements of arms and legs, but which are rather difficult to decipher.

McFadzean in West Africa treated 3 cases with corticotrophin, with inconclusive results, in 1953 [see this *Bulletin*, 1954, v. 51, 297].

Philip Manson-Bahr

Bangham, D. R. **Metabolism and Excretion of ^{14}C-Labelled Diethylcarbamazine.** *Brit. J. Pharmacol. & Chemotherapy.* 1955, Dec., v. 10, No. 4, 397–405, 3 figs. [14 refs.]

Stafford, J. L., Hill, K. R. & de Montaigne, E. L. **Microfilariasis in the Turks Islands. Report of Two Cases.** *West Indian Med. J.* 1955, Sept., v. 4, No. 3, 183–7, 1 fig.

Although the clinical phenomena of filariasis are seen in the southern regions of the British Caribbean area, cases have not hitherto been described in Jamaica or its dependencies. The purpose of this paper is to record the incidental diagnosis of symptomless microfilariasis in two patients from the Turks Islands who were under treatment for tuberculoid leprosy.

The microfilariae, which were sheathless, were carefully measured and photographed. The tail was sharp and the species was similar to that

of *Mansonella ozzardi*. [It does not seem clear in the text that there was no possibility of the patients having been infected elsewhere.]

Philip Manson-Bahr

Webber, Winfrith A. F. **The Filarial Parasites of Primates: a Review. I.—*Dirofilaria* and *Dipetalonema*.** *Ann. Trop. Med. & Parasit.* 1955, June, v. 49, No. 2, 123–41, 28 figs. [50 refs.] **II.—*Loa*, *Protofilaria* and *Parlitomosa*, with Notes on incompletely identified Adult and Larval Forms.** *Ibid.*, Oct., v. 49, No. 3, 235–49, figs. 29–35. [60 refs.]

In Part I of this review of filarial parasites of primates, excluding those species which are restricted to the human host, the genera *Dirofilaria* and *Dipetalonema* are considered. The dimensions of the various species, their hosts and geographical distribution, are given in tables. They are also briefly described and the validity and other taxonomic points of some of them are discussed. *Tawila tawila* Khalil, 1932, is included in the table of species of *Dirofilaria* but one is left in doubt as to whether or not this genus is to be regarded as a synonym of *Dirofilaria*. [*Dirofilaria aethiops*, also included in this table, is a *nomen nudum* and should be discarded.] The recorded dimensions of the microfilariae of the species of these two genera, *Dirofilaria* and *Dipetalonema*, are tabulated and the tail regions of some of them are reproduced in illustrations, as are also the relevant portions of the adult worms.

In Part II the genera *Loa*, *Protofilaria* and *Parlitomosa* are dealt with, together with "other adult and larval worms which have been found in primates and recorded as members of the Filarioidea". The last include a large number of microfilariae and "*Filaria*" spp. of primates and it is apparent that the author has searched the literature thoroughly for such references. A classified host list is appended.

J. J. C. Buckley

Ruiz Reyes, F. Oncocercosis. Observaciones de actualidad. [**Onchocerciasis**] *Medicina*. Mexico. 1955, Sept. 10, v. 35. No. 731, 401–9.

The author refers to previous surveys in 1946 and 1947 on the anatomical distribution of onchocercal nodules, carried out respectively in the Mexican States of Chiapas and Oaxaca, where the disease is rife. In the first survey he had found that the principal location of the nodules was on the iliac crests (19·5 per cent. of 993 nodules): in the second, the occipital region predominated (50·6 per cent. of 2,115). He has since, in 1954, confirmed this observation and found the highest percentage (24 per cent. of 870 nodules) on the occipital region. The findings for the 3 years are given in a lengthy table which shows the other common anatomical locations to be principally the costal, parietal, sacrococcygeal and temporal regions, in which the incidence varied between

approximately 5 and 15 per cent., though figures of 1·6 and 19·6 are also recorded.

He has made further studies of the dosage of diethylcarbamazine and after a discussion of various schedules concludes that 2 to 5 mgm./kgm. twice a day for 10 days was sufficient to destroy the microfilariae in 80 per cent. of cases between the third and fifth days of treatment. Later he found that treatment could be reduced to 5 days, thus lessening the time during which the patients would be away from work. Two schedules, modified for this purpose, are given.

Details are presented of an ophthalmological survey carried out in an endemic area in Oaxaca. Of 731 persons examined, 256 had conjunctivitis, 198 keratitis, 109 iritis, 30 lesions of the fundus, and 7 were blind in one or both eyes.

The author discusses at length the question of raising the general standard of health in rural areas among people of mixed ethnic groups and different levels of culture and hygiene. The onchocerciasis campaign is part of the attempt to raise these standards, but the problem is a large socio-economic and educational one. Attention is drawn to the annual immigration of large numbers (about 5,000) of labourers from Guatemala who arrive in Chiapas every year, especially in the coffee harvesting season (September to December), to supplement local labour. In 1953, 1954 and 1955, it was found that the numbers of cases of onchocerciasis in these immigrants were 137, 115 and 80, compared with 98, 82 and 47 in Mexicans. The implications of this immigration from a health standpoint are discussed.

Finally the author discusses the control of *Simulium* and in a table shows captures in several areas. Trials were made in 8 localities in heavily infected parts of Chiapas, of the application of DDT (50 per cent. wettable powder or 33 per cent. suspension) to streams at a concentration of 1 to 5 parts per million per 300 metres, at 15-day intervals (later 20 days). Satisfactory results were obtained with this larvicide and the numbers of adult *Simulium* were also very greatly reduced. Attack on the adult flies was also made with mist sprays; the difficulties of conducting this method of control economically are discussed.

H. J. O'D. Burke-Gaffney

Taufflieb, R. Une campagne de lutte contre *Simulium damnosum* au Mayo Kebbi. [**A Campaign to Control** *Simulium damnosum* **in the Mayo Kebbi Region, French Equatorial Africa**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 4, 564–76, 1 fig.

Until 1950 the occurrence of onchocerciasis was not suspected along the Mayo Kebbi in Chad, French Equatorial Africa; it had been confused with trachoma, but the authorities became alarmed at the steady depopulation of the area, especially around the Gauthiot Falls, and an

enquiry was made in the district of Léré. The presence of onchocerciasis was confirmed, *Simulium damnosum* was collected and the zone of influence of the insect was defined. Before beginning control work a *Simulium* and onchocerciasis survey was undertaken in 1954 and the probable limits of insecticidal operations were fixed. The author describes the organization of the 1955 control campaign in detail; the establishment of the insecticide depots, the quantities used, the methods of application, the hours worked and the difficulties encountered.

Two forms of treatment were employed. One was the spraying of an insecticide by helicopter over about 1,650 hectares [4,075 acres] of bush as an anti-adult measure. The insecticide (Gammophèle), which contained 150 gm. of gamma BHC to the litre, was mixed with gas oil in the proportion of 12·5 litres of insecticide to 100 litres of oil and was applied from 6 a.m. to 11 a.m. Two of the zones received 12 treatments and a third zone 6 treatments, each helicopter treating about 50 hectares per hour. Records of biting incidence were kept continuously from 15 February onwards and show that the last adult was captured on 24 February though the treatment was not stopped until a month later.

The other control method adopted was the treatment of the river itself with a simple emulsion made by mixing the same insecticide with river water and adding clay or laterite. The proportions used at the upstream end were 12 litres of the insecticide to 30 litres of river water and 6 litres of clay earth; this was to treat 25 kilometres (about 15 miles) of river. At two other downstream places the proportions were both 6:30:6 to treat 2 stretches of 12–15 kilometres (7½–10 miles) of water. Treatment began on 18 February and the mixture was applied at the rate of 1·5 litres per minute at each of the three places for half an hour; six treatments were given at each point at weekly intervals. No larvae were observed after 21 February and no adults emerged from collected pupae, but the treatment was continued until 27 March.

After an investigation into the toxic action of the insecticide on fish the original formulation was abandoned in favour of the above. An examination of the water of Lake Tréné showed that the insecticide accumulated only at the inlet from the river and there was no general pollution of the mass of lakewater; but it is suggested, as a safeguard, that if it should prove necessary to repeat the treatment, a hydrobiologist should be consulted. The air spray was too weak to have any serious effect on the local population of tsetse flies (*Glossina tachinoides*) though it was noted that after the spraying these flies were easier to collect. No effect on domestic animals was observed.

As the object of the work was to achieve results as soon as possible, both methods were employed simultaneously and their value cannot be judged separately. At the moment of reporting the results appeared to be entirely satisfactory but whether the work achieved complete success it was too early to say; another estimate was postponed until the following December [1955]. *H. S. Leeson*

Rossi-Espagnet, A. & Salera, U. Infestazione da *Gongylonema pulchrum* nell'uomo. [**Human Infection with** *Gongylonema pulchrum*] *Riv. di Parassit.* Rome. 1955, Oct., v. 16, No. 4, 221–4, 1 fig. [22 refs.]

The English summary appended to the paper is as follows:—

"The authors have observed in a ten years old girl, on the upper lip mucosa, two parasites, one of which has been identified as *G. pulchrum*. During the following four years no further elimination of parasites was observed. The authors discuss the probable mechanism of infestation."

Nauš, A., Odcházelová, E. & Uhrová, J. Oxyuriasis u školních dětí. [**Enterobiasis in Schoolchildren**] *Československ. Hyg., Epidemiol., Mikrobiol., Imunol.* Prague. 1955, v. 4, No. 7, 377–80.

An investigation of the incidence of enterobiasis in a school in Prague showed that 26 per cent. of 484 children were infected. The incidence in the separate classes ranged from 6 to 48 per cent. *D. J. Bauer*

Owings, R. S. **Pinworms and Oxytetracycline—Some of the Symptoms before Treatment.** *Antibiotic Med.* New York. 1955, May, v. 1, No. 5, 380–82.

After a survey of previous work by others the author describes the treatment with oxytetracycline of 42 children, aged up to 12 years, suffering from enterobiasis. The dose was 0·5 gm. daily for those under 5 years and 1·0 gm. daily over that age. The drug was given in divided doses for a period of 4 days.

In 32 cases, follow-up examinations were made for 2 weeks and only 2 patients were positive for *Enterobius* ova: 6-week follow-up was possible in 24, and 3 were positive. In one patient, treatment had to be discontinued owing to nausea and vomiting: 7 had mild diarrhoea: these symptoms eventually cleared.

A table gives a list of symptoms thought to be associated with enterobiasis: the commoner were vaginal itching (75 per cent.), restless sleeping (64), perianal itching (62), periumbilical pain and nose picking (59 each) and teeth grinding (38 per cent.).

The author notes that the cure rate was about 85 per cent. on a shorter course and at a dosage half that used by Loughlin *et al.* [this *Bulletin*, 1952, v. 49, 712] who obtained 100 per cent. cure from a 6-day course.

He points out that most of the patients had other infections amenable to oxytetracycline treatment. Treatment was accompanied and followed by a notable increase in appetite.

The author states that while oxytetracycline has " the highest percentage cure rate " for enterobiasis and is effective against mature worms and ova alike, its use should be limited to those patients having a co-existent infection requiring a broad-spectrum antibiotic, owing to its high cost. *H. J. O'D. Burke-Gaffney*

DEFICIENCY DISEASES

Davies, J. P. N. Nutrition et recherches en nutrition en Afrique Orientale anglaise. [**Nutrition and Nutrition Research in British East African Territories**] *Méd. Trop.* Marseilles. 1955, Sept.–Oct., v. 15, No. 5, 561–6.

This paper gives a history of nutrition problems in East Africa, together with a survey of the work undertaken to elucidate them, the organization of research and a review of the literature. Readers of this *Bulletin* will be familiar with the material covered, but French-reading nutritionists will welcome this survey written specially for *Médecine Tropicale* by Professor Davies and translated into French by Dr. Autret. The paper and its translation reflect the wide knowledge and experience of these two well-known workers in this field.

H. J. O'D. Burke-Gaffney

South Pacific Commission. Noumea, New Caledonia. **Diet and Nutrition in the Trust Territory of the Pacific Islands. A Survey** [Malcolm, Sheila]. *Technical Paper No. 83.* 1955, July, mimeographed pp. v + 42, 5 graphs (2 folding) & 1 map. [2s.]

The island population in the Pacific is so scattered that the collection of data on health is a formidable task for the investigator. Miss Malcolm has confined her attention to children under 2½ years. Five groups of islands were visited in the Marshall, Caroline and Mariana Islands. The quantitative side of the study was the weighing and measuring of the children. Growth and development from birth to 2½ years was on the whole satisfactory. However, between the ages of 8 and 16 months there was often a delay in growth. This corresponded to the period of weaning.

The economy of the islands is dominated by the coconut. Although much food is grown, the people are not self-supporting. Few cows are kept and these are seldom milked, but a limited amount of dried and canned milk is imported. Changing economic and social conditions have an important bearing on the availability and use of food. There is need for education relating to food and nutrition, especially in the small towns.

R. Passmore

South Pacific Commission. Noumea, New Caledonia. Études sur la nutrition et l'alimentation dans les Establissements Français de l'Océanie. [**Studies on the Diet and Nutrition in the French Possessions in Oceania**] [Malcolm, Sheila & Massal, E.]. *Technical Paper No. 85.* 1955, Apr., 47 mimeographed pp. [18 frs. CFP.]

This paper follows very similar lines to the previous one [above], although the two groups of islands are some three thousand miles apart. The coconut is the main economic product. Local agriculture and fishing do not supply all the needs of the people and some foods must be imported. Clearly there is need for health education to be carried on through maternity and child health services.

[The authors of these two papers have obviously had great difficulty in carrying out these limited surveys of child health. The difficulties imposed by distance and lack of communication would make the establishment of child health services equally difficult. Unfortunately, the authors do not discuss the practical difficulties in implementing their suggestions, although they must be aware of them. Indeed both reports are very brief, and we would like to know more about the interesting problems of child health and nutrition in the islands.] *R. Passmore*

Millis, Jean. **The Effect of Economic Background on Body Size of Chinese Infants in the First Year.** *J. Trop. Pediatrics.* London. 1955, Dec., v. 1, No. 3, 156–60. [11 refs.]

This paper is a statistical study of the records of the weights of over 20,000 children of pure Chinese ancestry born at Kandang Kerbau Maternity Hospital in Singapore. It is demonstrated that infants belonging to families in favourable economic circumstances are on the average heavier and longer at birth than those from poor families, and that they increase in weight more rapidly during the first year.

R. Passmore

Venkatachalam, P. S., Srikantia, S. G. & Gopalan, C. **Changes in Body Composition during Nutritional Rehabilitation.** *Indian J. Med. Res.* 1955, July, v. 43, No. 3, 511–6, 1 pl. & 1 graph.

Nitrogen balance studies and measurements of total body water (by the urea dilution method) were carried out on 8 undernourished emaciated persons, 3 of whom had clinical oedema, during nutritional rehabilitation for periods up to 88 days. In all there was marked nitrogen retention. There was also obvious clinical evidence of deposition of subcutaneous fat. Yet the gain in body weight was usually small and in some patients weight remained stationary for long periods. On the assumption that the lean body mass contained 72 per cent. water, it was found that all the subjects showed an increase in lean body solids less than would be expected from the observed nitrogen retention. The validity of the

assumption that the lean body mass has a constant water composition is questioned. Other evidence that nitrogen retention can occur without a corresponding increase in body weight is discussed. *R. Passmore*

Satoskar, R. S. & Lewis, R. A. **The Effect of Antibiotic Dietary Supplements upon the Plasma Proteins of Indian Students.** *Indian J. Med. Res.* 1955, July, v. 43, No. 3, 415–22.

Groups of 5 healthy Bombay medical students were given oxytetracycline 50 mgm., or tetracycline 50 mgm., or erythromycin 100 mgm., or placebos, daily for 8 weeks. At the end of this period in those receiving the oxytetracycline, plasma albumin had risen 0·66 gm./100 ml. and the gamma globulin had fallen by 0·25 gm./100 ml. With tetracycline there was a similar rise in plasma albumin levels and a drop in the first month in the gamma globulin levels, which, however, had returned almost to the initial level by the end of the second month. With erythromycin the changes were either small or irregular and there was no change with the placebos. The authors state that " the results confirm the beneficial effect of antibiotic supplements in persons whose intake of protein may be deficient in quality or quantity ". [The chemical effect of the antibiotics is certainly well demonstrated and of considerable biological interest. As the students appeared to enjoy good health originally and when taking the supplement, it is not quite clear how the effect was beneficial.] *R. Passmore*

Welbourn, Hebe F. **The Danger Period during Weaning. A Study of Baganda Children who were attending Child Welfare Clinics near Kampala, Uganda.** *J. Trop. Pediatrics.* London. 1955, June, Sept. & Dec., v. 1, Nos. 1, 2 & 3, 34–46; 98–111; 161–73, 10 figs. [Numerous refs.]

This study, which was the subject of a thesis submitted for the degree of MD, is concerned with the problems of Baganda children during the weaning period and especially with the incidence of kwashiorkor in children attending welfare clinics. This study follows on a previous investigation by the author [this *Bulletin*, 1952, v. 49, 297].

After a review of the literature relating to the problem in other parts of Africa, the author describes the background and environment of the children studied and outlines the procedure at the clinics and the methods used at some length. Weights and lengths of Baganda children are recorded and it is clear that from 6 months onwards their weight increase was no longer satisfactory: underweight tended to be related inversely to the educational status of the parents.

There is a considerable account of the feeding customs of the Baganda, of weaning and the diet after weaning. During the first 6 months of life, breast feeding was the rule and the supply was abundant; from the 5th month breast feeding was usually inadequate and mixed feeding was

started, mainly with carbohydrate foods. Weaning was usually complete at 14–15 months. The dietary deficiency, especially the protein deficiency, which was maximal during the weaning period was associated with profound disturbance of growth and the appearance of signs of kwashiorkor. These signs are fully recorded. Signs of mild kwashiorkor were found in about half the Baganda children of toddler age in this study. Mild kwashiorkor, the author states, is far more important than the severe condition as many " normal " children are affected: the effect may persist throughout life and retard physical and mental development.

The significance of malaria among these infants was examined. The highest incidence of morbidity due to malaria (as evidenced by anaemia and fever) was found at 6 to 12 months of age. When the effects were studied on individual children, it was found that the onset of malaria was often followed by very little disturbance to general health: the author believes that it is probably unwise, therefore, to attempt large scale chemoprophylaxis among Baganda children because of interference with natural immunity to malaria.

Other infections were studied, their incidence tabulated and their significance discussed fully. Respiratory infections, whooping cough and skin sepsis were the most important causes of ill-health. If the diet was inadequate, infections often resulted in prolonged impairment of weight gain. Such an effect seldom occurred when the diet was adequate.

The author points to the need for finding some cheap and acceptable protein food which can be given to the infants from the sixth month onwards: measures suggested are increased production of cow's milk, use of goat's milk (and possibly that of sheep) and increased consumption of local sources of vegetable protein, *e.g.*, soya beans, groundnuts, sunflowers. However, the preparation of such foods for infant feeding is probably beyond the present scope of most African housewives, so that it would be an advantage to have some form of commercially processed food available.

" Lack of protein in the diet overshadows every other aspect of child health in Uganda. . . . The danger period during weaning is a matter of concern to all who are interested in the future development of Uganda."

[This paper is a very full account of a considerable study which, while it does not profess to add anything new to our knowledge of kwashiorkor, relates it to a specific local enquiry and to findings elsewhere. It is all the more admirable in that " there has been no team of skilled research workers, but only myself, one African nurse, and one part time laboratory attendant ".] *H. J. O'D. Burke-Gaffney*

DE SILVA, C. C. **Kwashiorkor (Protein Malnutrition).** *Ceylon Med. J.* (n.s.) 1955, Sept., v. 3, No. 1. 55–79, 21 figs. [28 refs.]

This account is based on an experience of 127 cases seen in the Department of Paediatrics of the University of Colombo. For the most

part it is a clear and orthodox account not differing in any important respect from the descriptions from Africa.

The pathology and especially the morbid histology of the disease are well described.

The paper ends with an excellent plea for an energetic campaign of prevention. The author states that " the continued survival of this disease in Ceylon is a reflection on our civilization and our culture ". He then proceeds to point out practical ways of attack, which involve the cooperation of the Ministries of Health, Agriculture, Lands and Education. More plant proteins of good quality and more fish could be made available and mothers could be taught to use them. " No doling out of milk or other food can pay any dividends with . . . the abysmal ignorance of the mother with regard to sanitation, hygiene and nutrition. Lastly, what is needed above all is a public conscience." *R. Passmore*

Netrasiri, A. & Netrasiri, C. **Kwashiorkor in Bangkok.** (An Analytical Study of 54 Cases.) *J. Trop. Pediatrics.* London. 1955, Dec., v. 1, No. 3, 148–55, 3 figs.

This is the first full report of kwashiorkor coming from Thailand. An excellent account is given of 54 cases from which it is clear that the disease differs in no important respect from the descriptions given by workers in Africa. Vitamin deficiencies were, however, very prevalent. Angular stomatitis was present in 52 of the children and xerophthalmia and other ocular manifestations of vitamin A deficiency in 30. About half of the children also showed signs or symptoms which might be attributable to thiamine lack.

Lack of pigment in the hair was found in 18 of the children. The colour was reddish brown or straw; grey hair was not observed.

R. Passmore

I. Holemans, K. & Lambrechts, A., with the technical assistance of H. Martin. **Nitrogen Metabolism and Fat Absorption in Malnutrition and in Kwashiorkor.** *J. Nutrition.* 1955, Aug. 10, v. 56, No. 4, 477–94, 2 figs. [39 refs.]

II. Cheung, M. W., Fowler, Dorothy I., Norton, Patricia M., Snyderman, Selma E. & Holt, L. E., Jr., with the assistance of Eileen Hasselmeyer. **Observations on Amino Acid Metabolism in Kwashiorkor.** (A Preliminary Report.) *J. Trop. Pediatrics.* London. 1955, Dec., v. 1, No. 3, 141–7, 2 figs. [24 refs.]

I. The first paper records balance experiments on children suffering from kwashiorkor or malnutrition. Nitrogen balances were done on intakes varying from 150 to 1,000 or more mgm./kgm./day. The average

for the low group was 169 mgm./kgm./day. This corresponds to 1·06 gm. of protein/kgm./day. Protein appeared to provide only 8 per cent. of total calories. These are average figures. Two children received very much less protein. The authors ingenuously write: "We were able to conduct several balance experiments a few days before autopsy."

II. The second paper describes chemical studies on the urine of 3 patients with kwashiorkor. The clinical history of the second, a Mexican child, is given as follows:—

"*Bcundia*, a boy of 24 months, was also studied at the Hospital Infantil. . . His clinical picture was also that of typical kwashiorkor. He was studied immediately after admission, on a diet of tortilla and beans, similar to the one he had been receiving at home for some time previously. He died suddenly several days after the completion of the metabolism study."

[These two papers describe experiments in which, apparently, children admitted to hospital suffering from kwashiorkor were kept on diets low in protein, while urine and other material were collected for analysis. It cannot be too strongly emphasized that children seriously ill with kwashiorkor are always liable to sudden death. The therapeutic value of casein and other proteins is now fully established. The first consideration when such children are admitted to hospital is to supply a suitable source of protein. Only when this has been done is it permissible to plan a régime for the purpose of experiment. Failure to recognize this fact can only lead to a repetition of the tragedies here recorded.]

R. Passmore

Close, J. Contribution à l'étude du rôle des acides aminés dans l'étiologie du Kwashiorkor. [**A Contribution to the Study of the Rôle of Amino-Acids in the Aetiology of Kwashiorkor**] *Ann. Soc. Belge de Méd. Trop.* 1955, Aug. 31, v. 35, No. 4, 411–24, 2 figs. [24 refs.]

Full analyses of the content of amino-acids of human milk have been carried out by chromatographic methods. The milk of one African mother feeding a baby aged 4 months suffering from kwashiorkor, of another mother partially feeding a baby aged 12 months also suffering from kwashiorkor, and the pooled milk from 9 mothers with healthy babies, were all analysed. There was no significant difference between the percentage composition of amino-acids in these milks, nor did the analyses differ from reports of analyses of milk from Belgian and American women. The quality of the milk provided to these children with kwashiorkor was not demonstrably poor, but "a secretion of milk, notably more feeble than that of European women, may be considered, in one of the cases examined, as a causative factor in kwashiorkor" [abstracter's translation].

R. Passmore

RAMANATHAN, M. K. **Biochemical Changes in the Serum in Nutritional Oedema Syndrome (Kwashiorkor).** *Indian J. Med. Res.* 1955, July, v. 43, No. 3, 517–20. [13 refs.]

Studies of the changes in the constituents of serum obtained from kwashiorkor patients aged 1 to 3 years are given. The results may be summarized as follows:

	On admission	On disappearance of oedema	On discharge	Healthy children
Total protein gm. ...	5·0	5·9	6·9	7·5
Albumin gm. ...	2·3	2·8	3·5	4·2
Globulin gm. ...	2·7	3·2	3·4	3·3
Gamma globulin gm.	1·3	1·6	1·8	0·9
Urea mgm.	18	30	35	34
Total cholesterol mgm.	105	155	183	190

The degree of intestinal infestation was approximately the same as in the healthy children; the rise of gamma globulin may be associated with liver damage rather than infestation. In the paper statistical details of the findings for the individual serum constituents are given. These results should be useful as guides in assessing the progress of kwashiorkor patients in India. *R. Passmore*

THOMPSON, M. D. **Comparison of Milk and Soya Beans in the Treatment of Kwashiorkor in Uganda.** *Brit. Med. J.* 1955, Dec. 3, 1366–9.

Data was presented which show that soya beans are sometimes as effective as skimmed milk in the treatment of established kwashiorkor in young children. However, in at least one-third of the children given soya bean the treatment was unsatisfactory and had to be abandoned. The children often developed anorexia, and a larger volume of water is needed to form a fluid feed from soya of the same consistency as from skimmed milk. It is concluded that skimmed milk is the best therapeutic agent for established kwashiorkor and it is suggested that, where supplies are limited, they should be reserved for therapeutic purposes. However, soya beans and other vegetable sources of protein may be satisfactory in prophylaxis. Available sources of protein are not being used in the home because of ignorance. Education in the use and preparation of new foods is necessary. [See also DEAN, this *Bulletin*, 1953, v. 50, 141.] *R. Passmore*

See also p. 486, WADA [**Blood Picture of Children with Nutritional Dystrophy, especially Macrocytic Anemia. (Studies on the Nutrition of Children in Hirosaki Area.** 35th Report.)]. [**Effect of an Administration of the Skimmed Milk upon Blood Picture of Children with Nutritional Dystrophy.** (33rd Report.)] [**Bone Marrow of Nutritional Dystrophy with Macrocytic Anemia.** (32nd Report.)].

Huang, Po-chao & Tung, Ta-cheng. **Rice Enrichment Project in Sung-Shan, Taipei. III. Clinical and Biochemical Survey.** *J. Formosan Med. Ass.* 1955, May, v. 54, Nos. 4/5, 153–62, 2 figs. [15 refs.]

Experimental enrichment with vitamins of the B group of the rice in one province of the Philippines, and its effect on the health of the people, has provoked a great deal of interest. An international committee was appointed by FAO [this *Bulletin*, 1954, v. 51, 1088] to report on the Philippine study and on the advisability of enriching the rice in other countries in Asia. The committee were guarded in their opinion as to whether the results obtained justified the widespread introduction of enrichment. Clearly further trials of the effect of enrichment on other rice-eating populations would be most valuable. One such is reported here, carried out by members of the staff of the Taiwan National University, encouraged and financed by the Williams-Waterman Fund, which also assisted the Philippine survey.

The authors conclude that " Apparent improvement occurred a year later as to the suggestive signs of beriberi ". The appropriate words in this conclusion are " apparent " and " suggestive ". There was no control group. The main clinical symptoms in which improvement was reported were the common cold, digestive disturbances, fatigue, numbness and weakness of muscle. How the improvements were assessed is not stated. For the most part the reported changes were in subjective symptoms, which are known to be very difficult to evaluate. The biochemical work was confined to measurements of haemoglobin levels before and after one year of enrichment. Rises of from 1·6 to 2·6 gm./100 ml. were found, but as there were no controls the significance of this is quite uncertain. In fact the whole survey was so poorly planned and executed that it contributes nothing to the problem of evaluation of rice enrichment. *R. Passmore*

Money, G. L. & Smith, A. S. **Nutritional Spinal Ataxia.** *West African Med. J.* 1955, Sept., v. 4, No. 3, 117–23. [14 refs.]

Clinical descriptions of 4 African patients are given. Each was suffering from a neuropathy, in which spinal ataxia was the predominant feature. In 3 the visual acuity was markedly diminished. In not one of the patients was there any obvious cause for the disorder. [There seems little reason to ascribe the condition to defective diets alone. As far as dietary histories could tell, the food of these patients was certainly far from satisfactory, but no worse than that of large numbers of other persons in the same area. The patients were not closely associated and the origin of their disorders must remain obscure.] *R. Passmore*

SPRUE

Frazer, A. C. **Steatorrhoea.** *Brit. Med. J.* 1955, Oct. 1, 805–9, 5 figs. [16 refs.]

" Steatorrhoea is a descriptive clinical term. It indicates the passage of fluid or semi-fluid, bulky, pale, fatty, and usually offensive stools. It is incorrect to refer to the passage of formed stools as steatorrhoea, merely because the stool, on analysis, is found to contain more than the normal amount of fat."

Many points of practical and theoretical interest, in addition to the above definition of steatorrhoea, are dealt with in this authoritative paper. The origin of faecal fat in normal persons and those suffering from steatorrhoea is discussed. The author considers that there is little doubt that intestinal flora contribute to normal faecal fat, which is largely non-dietary in origin; there is no satisfactory evidence of fat excretion into the bowel. However, in many cases of steatorrhoea dietary fat contributes significantly to the faecal fat content; in other cases the increased fat is largely non-dietary. It is often difficult in an individual case of steatorrhoea to determine precisely the relative proportion of dietary and non-dietary fat lost in the stool. The proportion may vary from patient to patient and even from time to time in the same patient. Professor Frazer therefore suggests that it is " unwise to convert faecal fat figures into any coefficient of fat absorption ". The best method of expressing the result of faecal fat analysis is in terms of weight passed in the faeces in grammes per day.

The aetiology of steatorrhoea is discussed in some detail. Defects of small-intestinal absorption which may lead to steatorrhoea are classified into pancreatogenous, hepatogenous and enterogenous groups.

The pancreatogenous group is commonly associated with deficiencies of one or more pancreatic enzymes; it may also include incoordination of entry of pancreatic juice and chyme into the lumen, for example after gastro-enterostomy. Enzyme deficiency might arise from pathological changes in the pancreas or " more generalized disorders, such as hypoproteinaemia due to malnutrition ". The hepatogenous group includes cases of steatorrhoea associated with deficiency of bile or obstruction of bile flow as in lesions of the biliary tract. This group of absorptive defects is only occasionally associated with steatorrhoea, although the stools may be loaded with fat. The enterogenous group of absorption defects arises (1) from conditions of gross and irreversible pathological changes in the intestinal wall (regional ileitis, Whipple's syndrome, tuberculous enteritis, etc.), or (2) from conditions not associated with obvious pathological changes in the gut wall. The latter group includes gluten-induced enteropathies (the coeliac syndromes, mainly in children), tropical sprue, non-tropical sprue (excluding those which are gluten-induced) and anastomotic syndromes.

Tropical sprue is unrelated to dietary gluten and is closely associated with folic acid deficiency. The author believes that some dietary factor may be involved " and that this may be related to oxidative rancidity of unsaturated fatty acids ". Folic acid deficiency may also be important in developing the syndrome, which is, however, unlikely to arise from simple dietary deficiency.

Some patients " develop a more chronic form of the syndrome in which folic acid deficiency is no longer a dominant feature ". Maintenance of the syndrome even after removal of the patient to a temperate climate may be associated with changes in intestinal flora; such cases may respond dramatically to antibacterial therapy.

Diagnosis of the causes of steatorrhoea is made by separating the 3 main aetiological groups, as indicated in the following useful table:—

Investigation of Defects of Intestinal Absorption

Investigation	Expected Results		
	Pancreatogenous group	Hepatogenous group	Enterogenous group
Balance studies:			
Faecal fat	Markedly increased *	Markedly increased *	Increased *
,, nitrogen	Increased	—	May be increased
Short-chain fatty acids	May be increased	—	,, ,, ,,
Intubation studies:			
Pancreatic enzymes	Deficient *	Normal range	Normal range *
Bile salts	Normal range	Deficient *	,, ,, *
Absorption curves:			
Glucose	Normal	Normal	Depressed
Chylomicrograph	Flat	Flat	Flattened
Radiography:			
Flocculable media:			
Clumping	Absent	Absent	Present
Mucosal pattern	Feathery	Feathery	Not visible
Non-flocculable media:			
Pattern	,,	,,	Ladder or coin type
Diameter	Normal	Normal	Dilated

(" *Note*: The results recorded in the Table are the expected findings; some variations will be found, however, in individual patients. The observations marked with an asterisk are the key points in diagnosis.")

Fractionation of the enterogenous group is conducted further by studying the effects of a gluten-free diet and of the replacement of gluten in the diet. This is a slow process and some quick method of differentiation is still needed. The history of having lived in an endemic sprue area helps in the diagnosis of tropical sprue.

In treatment the basis should be a general dietary régime such as that introduced by FAIRLEY for the treatment of tropical sprue. A fat intake of 50 gm. or more is usually well tolerated. Specific measures are possible in pancreatic enzyme deficiencies, bile salt deficiencies and gluten-induced enteropathies. The patient with tropical sprue should be given folic acid 5 mgm. daily parenterally and in the absence of rapid improvement should be moved from the endemic area. The "more chronic" forms which do not respond to folic acid should be given antibacterial therapy, for example, succinyl sulphathiazole 6·0 gm. daily for 5 days, followed by chloramphenicol 1·5 gm. daily for 5 days, then chlortetracycline 1·5 gm. daily for a further 5 days. The effects of antibacterial therapy are still under examination.

[The reviewer wishes the author had spent a little more time explaining his definition of steatorrhoea and expanding his views on the treatment of tropical sprue.] *B. G. Maegraith*

HAEMATOLOGY

WADA, S. [**Blood Picture of Children with Nutritional Dystrophy, especially Macrocytic Anemia. (Studies on the Nutrition of Children in Hirosaki Area.** 35th Report.)] *Hirosaki Med. J.* 1955, v. 6, No. 3, 226–31. [18 refs.] [In Japanese.] English summary *51.

———. [**Effect of an Administration of the Skimmed Milk upon Blood Picture of Children with Nutritional Dystrophy.** (33rd Report.)] *Ibid.*, 232–40, 2 charts. [15 refs.] English summary *52–*53.

———. [**Bone Marrow of Nutritional Dystrophy with Macrocytic Anemia.** (32nd Report.)] *Ibid.*, 241–5. [11 refs.] English summary *54.

I. The author studied the blood picture in 40 boys aged 8 to 10 in the Hirosaki area of Japan. They were apparently healthy, but showed some clinical signs of nutritional dystrophy.

He found normocytic hypochromic anaemia in 29, macrocytic hypochromic in 5, macrocytic normochromic in 3 and normochromic in 2.

The macrocytic anaemias responded well to folic acid, but very little to vitamin B12, and were improved gradually by nicotinic acid or skimmed milk. The author notes that his colleague SATO had found degeneration of liver cells in biopsies from children with nutritional

dystrophy and suggested that disturbance in the utilization of folic acid was a contributing factor in the pathogenesis of macrocytic anaemia in this condition.

The macrocytic anaemia found by the present author is stated to be similar in many respects to that reported by Trowell as "dimorphic anaemia" in Africans with kwashiorkor [this *Bulletin*, 1952, v. 49, 536].

Leucopenia was found in 19 cases, neutropenia in 30, monocytopenia in 23, lymphocytosis in 25 and eosinophilia in 26 cases.

II. In this paper the effect of skimmed milk on some of the children referred to above is described. The milk was given for 135 days, in quantities of 25 gm. daily. The blood picture was studied beforehand and on the 36th, 93rd and 135th days.

In 9 cases of macrocytic hypochromic anaemia treated with skimmed milk, the red cell count increased in 8, the MCHC in all and the platelet count in 7. In 5 the MCV decreased. Lymphocytosis occurred in 4 cases.

In 8 of the treated children who had normocytic hypochromic anaemia, the red cell count increased in only 3, the MCHC in 6 and the platelet count in 4. In 3 cases there was "a slight fluctuation" of the MCV. Lymphocytosis occurred in 7.

The improvements noted are attributed to the folic acid or the tryptophan in the skimmed milk, or to both. The decrease in red cells after treatment in the cases of normocytic hypochromic anaemia is explained by a relatively more rapid increase in plasma volume.

III. Myelograms are shown of 3 children with nutritional dystrophy who showed evidence of macrocytic anaemia. The prominent features were an absence of megaloblasts and a marked hyperplasia of macroblasts, which were respectively 48·6, 21·5 and 22·5 per cent. The author states that similar findings have been reported by Trowell [*loc. cit.*].

H. J. O'D. Burke-Gaffney

Brown, A. **Megaloblastic Anaemia associated with Adult Scurvy: Report of a Case which responded to Synthetic Ascorbic Acid alone.** *Brit. J. Haematol.* Oxford. 1955, Oct., v. 1, No. 4, 345–51, 3 figs. [22 refs.]

Bezon, A. Proportion de sicklémiques observée en pays Kabré (Togo). Contribution à l'étude de la sicklémie dans la sous-race soudanaise. [**Incidence of Sicklaemia in the Kabré Group, Togo, French West Africa**] *Méd. Trop.* Marseilles. 1955, July–Aug., v. 15, No. 4, 419–22.

The following is a translation of the author's summary:—

During the course of medical work, it has been possible to study sicklaemia in 1,104 Africans of a group in Lama-Kara in northern Togo.

This was achieved by means of samples taken from different geographical points in order to exclude possible local factors.

The results obtained proved to be statistically homogeneous. The average incidence of sicklaemia for the Kabré racial group, which belongs to the Soudanese sub-race, could be estimated at 9·8 per cent. The Kabré sub-group itself and the combined Lossos and Défalés [all collectively known as Kabré] showed comparable averages, namely 10·8 and 7·5 per cent., respectively. *H. J. O'D. Burke-Gaffney*

Stewart, J. W. & MacIver, J. E. **Sickle-Cell/Haemoglobin-D Disease in a Mulatto Girl.** *Lancet.* 1956, Jan. 7, 23–5, 6 figs. [23 refs.]

"A woman with sickle-cell/haemoglobin-D disease inherited the abnormal haemoglobin D from her English mother. The father, a West African Negro, was dead and is assumed to have supplied the gene for the haemoglobin S. One of the patient's brothers had also inherited the abnormal haemoglobin D."

Schwartz, S. O. & Hartz, W. H., Jr. **Mediterranean Anemia in the Negro. A Re-Evaluation of Four Patients and their Families.** *Blood.* 1955, Dec., v. 10, No. 12, 1256–66, 5 figs.

"1. Four Negro patients and their families previously reported in 1949 as examples of Mediterranean anemia were re-evaluated with regard to hemoglobin composition. The data have been presented.

"2. Mediterranean anemia was confirmed in one entire family and in the index case of another family.

"3. Two entire families and one member of another family were found to possess hemoglobin C.

"4. Differential diagnostic points of Mediterranean anemia and hemoglobin C disease are presented."

[See this *Bulletin*, 1949, v. 46, 966.]

Field, C. Elaine & Eu Tan, Eleanor. **Chronic Haemolytic Anaemia. A Report of Three Cases of Cooley's Anaemia and Five Cases of Acholuric Jaundice seen in Malaya with a Discussion on the Differential Diagnosis.** *Med. J. Malaya.* 1955, Sept., v. 10, No. 1, 60–82, 10 figs.

Kunkel, H. G. & Wallenius, G. **New Hemoglobin in Normal Adult Blood.** *Science.* 1955, Aug. 12, v. 122, 288, 2 figs.

The authors record the finding of a new haemoglobin which was consistently present in small amounts in normal adult blood. The technique

of separation is described in detail and the electrophoretic findings are illustrated.

This slowly migrating component was markedly different in mobility from haemoglobin A. It could be detected in the blood of all normal persons examined and of patients with various anaemias; but it was absent from or greatly reduced in the blood of newborn infants with predominantly foetal haemoglobin.

Increased levels were found in patients with thalassaemia minor, but not in those with thalassaemia major when considerable amounts of foetal haemoglobin were present.

The authors suggest that this haemoglobin is probably identical with the small component observed by Singer *et al.* [this *Bulletin*, 1955, v. 52, 289] in the blood of persons with thalassaemia, which was not identified previously as a haemoglobin. *H. J. O'D. Burke-Gaffney*

VENOMS AND ANTIVENENES

Plisnier, H., with the collaboration of R. Annaert. Etude expérimentale au sujet de l'action des venins de Bothrops sur la coagulation sanguine. [**Experimental Studies on the Action of *Bothrops* Venom on Coagulation Time**] *Bruxelles-Méd.* 1955, Oct. 30, v. 35, No. 44. 2167–79, 3 figs. [47 refs.]

The venom of *Bothrops* spp. contains a non-toxic haemocoagulase which acts mainly by accelerating the thrombin-fibrinogen reaction. The active principle of the venom can be standardized turbidimetrically against a solution of fibrinogen. Administration intramuscularly of the standardized coagulase in various clinical conditions and at operations such as thyroidectomy was followed by a notable and prolonged fall in coagulation time. The authors consider that the coagulase is likely to be of value as pre-operative therapy. *B. G. Maegraith*

Shibeika, Y. **Subarachnoid Haemorrhage following a Scorpion Sting.** *Sudan Med. J.* 1953, Jan., v. 1, No. 1, 40.

Report of a Case.

Tange, Y. Beitrag zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen. XII. Über den Giftapparat bei *Xesurus scalprum*. (Cuvier et Valenciennes) [**Morphology of the Poison Apparatus of Japanese Fish. XII. Poison Apparatus of *Xesurus scalprum***] *Yokohama Med. Bull.* 1955, June, v. 6, No. 3, 171–8, 4 figs. [16 refs.]

TOXOPLASMOSIS

Durall, C. S. & Vilardell, F. Risultati dell'intradermoreazione alla toxoplasmina nella popolazione di Barcellona. (Inchestia sanitaria.) [**Epidemiological Survey with Toxoplasmin in the Population of Barcelona**] *Igiene Moderna.* 1955, Sept.–Oct., v. 48, Nos. 9/10, 667–77, 2 figs. [21 refs.] English summary (7 lines).

Among 1,053 people 27·63 per cent. were positive, the maximum being 53·6 per cent. between the ages of 30 and 40.

Schneider, J., Goddard, D. & Heinz, H. J. **A Toxoplasmin Skin-Testing Survey amongst a Group of South African Bantu.** *South African Med. J.* 1955, Dec. 10, v. 29, No. 50, 1162–5. [22 refs.]

The authors made a skin-testing survey on 209 Africans in Johannesburg using as antigen a toxoplasmin extract (diluted 1:3) prepared by the method of Westphal. There were 31 per cent. positive reactors, none below the age of 9 years, but increasing gradually thereafter. Out of 28 positive cases the dye test was negative in 8. The reliability and usefulness of the toxoplasmin skin test in population surveys are discussed and the authors agree with Sabin's view that it has a place in such surveys as long as the relative crudeness of the tool is remembered.

I. A. B. Cathie

Jacobs, L., Melton, Marjorie L. & Cook, M. Katherine. **Observations on Toxoplasmosis in Dogs.** *J. Parasitology.* 1955, Aug., v. 41, No. 4, 353–61. [20 refs.]

In view of the uncertainty regarding the epidemiological rôle of dogs in human toxoplasmosis, the authors carried out an investigation on experimentally infected dogs, in which the course of the infection and the method of its transmission were studied. The experiments were made with 23 dogs of different ages, which were fed with infected tissues or inoculated parenterally with a virulent strain of *Toxoplasma* (RH). It was found that only young pups developed acute disease, with parasites in the tissues, including the lung, as well as in the urine. However, even in these cases toxoplasms could rarely be detected in animals sacrified 3 months after infection. In older animals the infection ran a symptomless course. Transient parasitaemia was observed in dogs with acute and with latent infection, and positive reaction to the dye-test was rapid after parenteral inoculation.

Attempts were made to transmit toxoplasmosis to mice by feeding or inoculating them with the urine and faeces of infected dogs, but the results were negative. Likewise pups kept with an infected litter mate failed to become infected. In view of the occurrence of parasitaemia in

infected pups, it is suggested that the infection might be transmitted by arthropods.

Since in most cases canine toxoplasmosis runs a symptomless or subclinical course, and because the parasites are not resistant to external conditions (*e.g.*, in the excreta), it is concluded that " the chances that dogs serve to spread the infection to humans by any direct means seem to be small ", but it is possible " that because of their close association dogs and man may acquire the infection from the same source ".

C. A. Hoare

Schmidtke, Liselotte. Histologische Untersuchungen an toxoplasmainfizierten Insekten (*Calliphora erythrocephala, Periplaneta americana*). [**Histological Examinations with Toxoplasma-Infected Insects** (*Calliphora erythrocephala, Periplaneta americana*)] *Zent. f. Bakt.* I. Abt. Orig. 1955, v. 164, Nos. 6/7, 508–13. [14 refs.]

The English summary appended to the paper is as follows:—

" Larvae and imagines of *Calliphora erythrocephala* and *Periplanata americana* had during a longer period been infected with *Toxoplasma gondii* and histologically examined. Neither Toxoplasmae nor other forms could be found which respond to the known stages of development of other parasitic protozoa. Accordingly there is no parasite-host relation between *Toxoplasma gondii* and non-stinging insects."

DERMATOLOGY AND FUNGUS DISEASES

See also p. 442, Giordano, La protozoosis intestinal en algunas dermatosis reactivas. [**Intestinal Protozoal Infections in Various Forms of Allergic Dermatitis**]

Reifferscheid, M. & Seeliger, H. Monosporiose und Maduromykose. [**Monosporiosis and Maduromycosis**] *Deut. med. Woch.* 1955, Dec. 16, v. 80, No. 50, 1841–4, 1867. [50 refs.]

The English summary appended to the paper is as follows:—

" A therapy-resistant mycosis is described affecting the right thigh and buttock of a 57 years old woman. Because of the presence of granules the disease was diagnosed as actinomycosis and treated, without success, with chemotherapeutic and antibiotic agents. Cultures and serological tests revealed an infection with Monosporium. The occurrence and aetiology of monosporiosis and related mycetomata are discussed. In consequence of promising in-vitro experiments the patient was treated with diacetyl-2′2-dioxy-5′5-dichloro-diphenylsulphide by mouth; oily suspensions of the drug were also injected right into the mycetoma. Under

this treatment, which was supplemented by surgical removal of the fistulae, the tumour healed; some pain in the region of the sciatic nerve persisted."

Harrell, E. R., Bocobo, F. C. & Curtis, A. C. **A Study of North American Blastomycosis and its Treatment with Stilbamidine and 2-Hydroxystilbamidine.** *Ann. Intern. Med.* 1955, Nov., v. 43, No. 5, 1076–91, 2 figs. [13 refs.]

Very favourable reports have been made on the treatment of North American blastomycosis (*Blastomyces dermatitidis*) with the diamidines, stilbamidine and 2-hydroxystilbamidine [see this *Bulletin*, 1953, v. 50, 758, 1074; 1954, v. 51, 982, 1295; *Bull. Hyg.*, 1952, v. 27, 1112; 1953, v. 28, 821]. The present authors, however, consider that in many instances, cure of the disease has been claimed without an adequate period of follow-up observation and that, in fact, relapse is much more frequent than is generally known.

Descriptions are given of the results of treatment with diamidines in 6 cases of systemic North American blastomycosis, in 2 of which, however, the active disease at the time of treatment appeared to be confined to the integumentary system.

In case 1, with pulmonary and cutaneous lesions and involvement of lymph nodes, apparently complete cure was effected by stilbamidine in daily doses of 150 mgm. intravenously, to a total dosage of 3·0 gm. in two courses.

Case 2 was of a very severe type with extensive pulmonary disease and involvement of the prostate, lymph nodes, and ribs, vertebrae and long bones, with subcutaneous abscesses in various parts of the body. The patient had been admitted to hospital on 9 occasions and had been treated unsuccessfully with potassium iodide, sulphadiazine and with various antibiotics. "Death was imminent" when treatment with stilbamidine was commenced, but this treatment proved effective, as shown by the gradual healing of the cutaneous and osseous lesions and radiological signs of improvement in the extensive pulmonary disease. Nevertheless, new blastomycotic skin lesions and subcutaneous abscesses developed from time to time, but eventually clinical cure was achieved. The patient had received in all 22·50 gm. of stilbamidine and 2·80 gm. of 2-hydroxystilbamidine, the latter drug not being well tolerated. In one course of stilbamidine the daily dose was increased to 300 mgm. with good results and no untoward effect except nausea. The duration of the disease was 7 years and, despite the clinical cure, caution in prognosis was considered necessary.

In case 3 the lesions were cutaneous but there was a history of recent pulmonary disease. The cutaneous lesions responded well to a total dosage of 3·3 gm. stilbamidine, but after discharge from hospital these lesions became active again.

Case 4, with involvement of lungs and skin, was cured with a total dosage of 3·0 gm. stilbamidine, but despite this small dosage the patient developed persistent trigeminal neuropathy.

Case 5, erroneously diagnosed as pulmonary tuberculosis, developed skin lesions on which the diagnosis of blastomycosis was made. After treatment with potassium iodide and radiotherapy, stilbamidine was administered and to the first course of 35 doses the response was "dramatic", but, although the cutaneous lesions were healed, the pulmonary disease remained active. Further courses of treatment, even with the daily dose of 300 mgm., were not effective and after 15·60 gm. had been given, it was considered that stilbamidine alone could not effect a cure. The disease was of 10 years' duration.

In case 6, the lesions were confined to the skin of the cheek and the mucosa of the gum and lip; 2-hydroxystilbamidine was given in doses of 225 mgm. daily, and after 20 doses the oral and cutaneous lesions had almost completely healed. Three weeks later there was a relapse and despite further courses of 2-hydroxystilbamidine to a total dosage of 18·225 gm. and potassium iodide, the disease was not cured. Stilbamidine in doses of 300 mgm. daily to a total of 2·7 gm. caused improvement but provoked intolerable nausea and vomiting. Four months later the disease was still active but the patient refused further treatment.

Toxic effects of stilbamidine, manifested by trigeminal neuropathy, occurred in the 4 patients who belonged to the white race; the remaining 2, who were Negroes, were not so affected.

There was no correlation between the extent or severity of the disease and the response to diamidine treatment, and the authors consider that the favourable response is largely due to immunological factors. Failure of the treatment seemed to be associated with absence of dermal sensitivity to blastomycin and the presence of the specific complement-fixing antibody in the blood, a combination which Smith [this *Bulletin*, 1950, v. 47, 156] considered to be of unfavourable prognostic significance.

J. T. Duncan

Segretain, G. & Drouhet, E. Blastomycoses expérimentales du hamster doré. [**Experimental Blastomycoses of the Golden Hamster**] *Ann. Inst. Pasteur.* 1955, Nov., v. 89, No. 5, 593–6, 6 figs. on pl. [11 refs.]

In recent years, the golden hamster of Syria has proved to be one of the most useful animals for experimental infections, including studies with *Actinomyces israeli*, and the fungi *Histoplasma capsulatum* and *Sporotrichum schencki*. The authors have therefore tested the susceptibility of the hamster to infection by *Blastomyces dermatitidis* and *Paracoccidioides brasiliensis*, species to which the commoner laboratory rodents are relatively resistant.

In tests with *B. dermatitidis*, cultures in the yeast phase and in the mycelial phase were used and the inoculations were made by the peritoneal route. Hamsters inoculated with the yeast-phase culture died in about 34 or 35 days but those inoculated with the mycelial phase were still alive after 6 months. At necropsy, disseminated, nodular lesions were found in the peritoneum and pneumonic patches in the lungs, the liver and other organs were congested and in one animal a focus of suppuration was found in the testis. The parasitic *Blastomyces* cells were numerous and often intracellular in the granulomata and in the pneumonic exudate.

In experiments with *P. brasiliensis*, hamsters inoculated intraperitoneally with the yeast-phase cells (Strain 55 Oswaldo Cruz) survived for about 71 days, and those inoculated with the mycelial form (Strain 56 Oswaldo Cruz) about 145 days. At autopsies on 36 animals lesions were found in various parts of the peritoneal cavity in 13, usually as chains of nodules; the spleen in 11 and the liver in 9 were enlarged and presented nodules and micro-abscesses; the testes in 7 showed granulomatous nodules and orchitis; the lungs were congested in 5, but gross lesions were not found in the brain or kidney.

Lesions were granulomatous and chiefly of the nodular or follicular type, well circumscribed by a limiting zone of fibroblastic activity. The parasites, sometimes in the multiple budding form, were often seen within giant cells towards the centre of the nodule, but they were also seen as extracellular groups surrounded by masses of polymorphonuclear cells and lymphocytes. Some of the parasitic yeasts showed a thick covering of hyaline, eosinophilic material which was occasionally drawn out into finger-like processes recalling the club-formations on " grains " of *Actinomyces*.

Emulsified tissue from lesions containing the parasite appeared to be less infective than the culture material when injected into the peritoneum.

In the authors' experience, the hamster is the only animal in which a generalized infection by *P. brasiliensis* can easily be obtained by experimental inoculation. *J. T. Duncan*

Wayne, L. G. & Juarez, W. J. **Isolation of *Coccidioides immitis* from Spinal Fluid by Molecular Filter Membrane Technic.** *Amer. J. Clin. Path.* 1955, Oct., v. 25, No. 10, 1209–11, 1 fig.

The use of molecular filter membranes as a means of concentrating micro-organisms from samples of cerebrospinal fluid, was demonstrated in 2 cases of coccidioidal meningitis. In both cases, despite the clinical evidence of progressive disease, repeated attempts, by other means, to find *Coccidioides immitis* in the cerebrospinal fluid had failed.

The membranes used were 47 mm. grid marked, black, HA type of Millipore filter, in Pyrex filter holders. Specimens of cerebrospinal fluid of 5 to 15 ml. each were passed through the membranes, followed by 10 ml. of sterile distilled water. The membranes were then placed, with the grid or inoculated surface upward, on solid brain heart infusion agar medium in a screw-capped tube and incubated at 37°C. or at room temperature. Of 4 samples of fluid from patient A, 2 yielded cultures of *C. immitis* on the filter membrane, one of 2 colonies and the other a single colony. Of 3 samples from patient B, one yielded 2 colonies of *C. immitis*. The whitish colonies were visible to the naked eye against the black background of the filter membrane (for this reason, black membranes had been used in preference to white) after 3 to 6 days' incubation. The colonies were from 1 to 3 mm. in diameter and after 5 days they became fuzzy and the infective arthrospores were present.

In these 2 cases the method of concentration by filtration before culture succeeded when only one or 2 fungal elements were present in a sample, and concentration by centrifugation could not have been expected to achieve such an effect. The cerebrospinal fluid, in both cases, was cloudy but not viscous; it would be difficult and in some cases impossible to pass a purulent fluid through such a filter in quantity. *J. T. Duncan*

TROPICAL OPHTHALMOLOGY

Thygeson, P. **The Cytologic Diagnosis of Trachoma.** *Rev. Internat. du Trachome.* 1955, v. 32, No. 4, 421–37, 8 figs. [18 refs.]

Bietti, G. B. & Pannarale, M. R. Premiers résultats du traitement du trachome par la N,N′ dibenzyléthylendiamine dipénicilline G. (Benzathine pénicilline G, Wycillina A.P.) administrée en injections espacées. Valeur de cette technique dans les traitements de masse. [**First Results of Trachoma Treatment by Dipenicillin G (Benzathine-Penicillin G, Wycillina A.P.) by Repeated Injections; Value of the Technique for Mass Treatment**] *Rev. Internat. du Trachome.* 1955, v. 32, No. 3, 354–69. [37 refs.]

The value of the technique for the mass treatment of trachoma by injections of dibenzylethylenediamine dipenicillin G (benzathine penicillin G, Wycillina AP) at intervals of 14–30 days, is discussed by the authors. In the present study 35 patients have been treated by benzathine penicillin G, all of whom were in the florid stage of trachoma. The

comparatively small numbers of patients studied does not allow a comparative statement on the difference of action of diverse ways of administration of the drug; it is, however, possible to point out that treatment with benzathine penicillin G for 20 days (4 or 6 injections) is able to cure completely a high average of patients suffering from trachoma. The authors, however, point out that this treatment should be tried on a large scale, especially on patients who cannot easily be surveyed. The studies prove that penicillin is active on the trachomatous virus and that like the sulphonamides a constant and moderate rate of penicillin in the blood is more effective in trachoma than high and transitory rates. Further studies are being carried out on the possibility of subconjunctival administration of the drug to lower the cost of the cure.

E. W. O'G. Kirwan

Mitsui, Y., Yamashita, K. & Hanabusa, J. **Treatment of Trachoma with Tetracycline.** *Antibiotic Med.* New York. 1955, Apr., v. 1, No. 4, 225–6.

Tetracycline was found to be effective against the trachoma virus and it appeared to be superior to chlortetracycline. When this antibiotic was used in the treatment of 205 chronic trachoma cases, clinical cure was obtained in 75 per cent. of the patients three months after termination of therapy. Relapses were uncommon. *D. P. Choyce*

Rais, H. Premiers essais de traitement du trachome par l'érythromycine. [**Trials of the Treatment of Trachoma with Erythromycin**] *Rev. Internat. du Trachome.* 1955, v. 32, No. 4, 459–62.

The English summary appended to the paper is as follows:—

"Action of Erythromycin on trachoma is identical to Aureomycin's: degeneration of epithelial inclusions, vanishing of subjective semeiology in few days, of follicles, of trachomatous pannus in a few weeks.

"Modern treatment of association trachoma-bacteria should be a topical treatment by one of these ointments."

Pannarale, M. R. La magnamycine dans le traitement du trachome. [**Magnamycin (Carbomycin) in the Treatment of Trachoma**] *Rev. Internat. du Trachome.* 1955, v. 32, No. 4, 448–58. [12 refs.]

The author, from Parma, Italy, discusses the value of carbomycin in the treatment of trachoma, and gives details of 19 patients treated with a 1 per cent. ointment 5 times daily for variable periods. He found that the antibiotic was active not only on conjunctival bacteria, but on

trachoma virus: degenerative changes occurred in the Halbertstaedter-Prowaczek bodies.

The results are tabulated. Persistent treatment resulted in cure, but relapses occurred if the treatment was stopped too soon, *viz.*, in 15 days. Most of the patients were treated for 70 to 80 days.

H. J. O'D. Burke-Gaffney

HEAT STROKE AND ALLIED CONDITIONS

Robinson, K. W., Howard, B. & MacFarlane, W. V. **Observations on Seasonal Fluctuations in 17-Ketosteroid Output in the Subtropics and Tropics.** *Med. J. Australia.* 1955, Nov. 5, v. 2, No. 19, 756–9, 1 fig. [15 refs.]

The English summary appended to the paper is as follows:—

"1. The excretion of 17-ketosteroids has been followed fortnightly in seven subjects over twenty months in Brisbane. There was a mean reduction of 27·3% during February and March relative to July and August, and this difference has less than one chance in 1000 of being random.

"2. Subjects being acclimatized in the tropics showed an initial increase of 17-ketosteroid output followed by a decrease during summer and a rise again in winter.

"3. Acute exposure to a hot environment (105°F. dry bulb, 85°F. wet bulb) for seven hours produced a fall of 15·4% in males and 4·2% in females for the twenty-four hours' excretion of 17-ketosteroids.

"4. Thirty-one males, aged eighteen to twenty-three years, during summer, showed a mean 17-ketosteroid excretion of 14·3 ± 4·5 milligrammes in twenty-four hours; nine females, aged eighteen to twenty years, excreted a mean of 9·6 ± 3·2 milligrammes in twenty-four hours; six older males, aged twenty-one to forty years, excreted a mean of 13·2 ± 3·5 milligrammes in twenty-four hours throughout the year."

See also p. 367, Ellis *et al.*, **Transient Miliaria Profunda and Heat Incapacitation.**

MISCELLANEOUS DISEASES

Nwokolo, C. **Endomyocardial Fibrosis and other Obscure Cardiopathies in Eastern Nigeria.** *West African Med. J.* 1955, Sept., v. 4, No. 3, 103–16, 3 figs. [18 refs.]

The literature relating to endomyocardial fibrosis is here briefly reviewed, and the records of 4 cases of the disease are presented. These have been selected from among the first 40 cardiac patients admitted to the medical wards of the General Hospital, Enugu, Nigeria, between September 1953 and February 1955. Three additional cases are also described, one of obscure cardiopathy of Fiedler's type and two of unexplained dilatation of the ventricles. One of the patients with endomyocardial fibrosis is of especial interest in that he was under continuous observation in hospital from the age of 5 years, when he was admitted suffering from kwashiorkor, to the age of 7½ when he died. At post mortem the right auricle was found to contain a large mass of recent ante-mortem clot, and the interior of the right ventricle was covered with a white, tough, fibrous mass. There was only a negligible amount of myocardial fibrosis. The liver showed a considerable amount of fine cirrhosis which was predominantly centrilobular.

The author, quoting a report of 2 cases of supposed endomyocardial fibrosis in well-fed Europeans regards it as unlikely that malnutrition in the ordinary sense is the cause of the disease. He, however, considers it possible that once the original cardiac injury has occurred, malnutrition may accelerate cardiac damage. The other possibility is that toxic factors—perhaps contained in bush teas—are responsible. He considers that any theory of the cause of endomyocardial fibrosis must explain: (1) the geographical distribution of the disease in Africa, *i.e.*, Uganda, Sudan, Nigeria; (2) the fact that it has occurred in Europeans living for a few years in Africa, in whom malnutrition appears unlikely; (3) the fact that all ages (above 5) and both sexes are included among the recorded cases; (4) the inconstancy of cellular infiltration in the myocardium. [Regarding the second of these conditions it is doubtful whether it should be taken as a fact that the disease has occurred in Europeans. Two cases resembling it have been reported in Europeans but it is not yet established that the disease is identical with that found in Africans. Until this is established undue importance should not be attached to this isolated report.] *A. W. Woodruff*

Chambon, L. Isolement du bacille de Whitmore à partir du milieu extérieur. [**Isolation of Whitmore's Bacillus from Outside Material**] *Ann. Inst. Pasteur.* 1955, Aug., v. 89, No. 2, 229–35, 1 fig. [15 refs.]

A total of 150 samples, either of mud from parks and gardens, arroyos [rivulets], paddy fields or ponds, or water from paddy fields, ponds or

arroyos, were examined for the presence of *Malleomyces* [*Pfeifferella*] *whitmori* by the following methods.

For earth: 5 gm. of earth were added to 150 ml. of Levine's medium (lactic acid, 0·06 M; KH_2PO_4, 0·1 M; $MgSO_4$, 0·0005 M; $FeSO_4$, 0·0000025 M; and sufficient NaOH to adjust the *p*H to 6·5); samples from 48-hour cultures were spread on Levine's medium solidified with: lactose, 10 gm.; eosin, 0·4 gm.; methylene blue, 0·065 gm. and agar, 15 gm., added to 1,000 ml. Levine's medium (LBME) and on MacConkey's medium, and injected into guineapigs. Colonies resembling Whitmore's bacillus obtained directly on LBME or MacConkey's medium, or from cultures from heart blood or abscesses of infected guineapigs were identified by agglutination tests, pathogenicity and biochemical reactions.

For water: 20 ml. of aluminium hydroxide gel previously sterilized at 110°C. for 15 minutes were added to 1 litre of water; the supernatant was decanted till only 50 ml. of mixture remained in the flask, and 150 ml. of Levine's medium added to it. Further procedure was as for earth.

Seven strains were isolated from 5 samples; one from pond mud, 6 from water (3 from 2 samples from paddy fields, 3 from 2 samples of pond water); no strain was isolated from parks or gardens, mud from paddy fields, or from arroyos. *C. L. Oakley*

Lagarde, C. Note sur la fréquence des infiltrats labiles au Nord Viet-Nam. Données numériques sur 30,000 examens. [**Incidence of Transient Pulmonary Infiltrations in North Viet-Nam among 30,000 Persons Examined**] *Méd. Trop.* Marseilles. 1955, July–Aug., v. 15, No. 4, 428–9.

Routine X-ray examinations of the chest were made of some 30,000 adult refugees, of varied origin, in Haiphong between January 1951 and May 1952. In 236 cases (0·786 per cent.) a transient pulmonary infiltration, usually involving one lung only, was found to be present in association with a hyper-eosinophilia and the presence of an *Ascaris* infection. *A. R. D. Adams*

Chang, C. Y., Witschi, E. & Ponseti, I. V. **Teratogenic Effects of *Lathyrus odoratus* Seeds on Development and Regeneration of Vertebrate Limbs.** *Proc. Soc. Exper. Biol. & Med.* 1955, Oct., v. 90, No. 1, 45–50, 9 figs.

"The evidence presented indicates that β-aminopropionitrile is the teratogenic agent of the seeds of *Lathyrus odoratus*. It produces dislocation of joints and loosening of intersegmental septa in amphibians, and bending of the femurs in chick embryos. The minimal teratogenic

concentration for Xenopus larvae is ·5 μl/liter, the minimal dose for chick embryos is ·1 μl per egg. The effects are highly tissue specific but not species specific. The available evidence suggests that a single morphogenic process is interfered with by the presence of this compound during differentiation."

PARASITOLOGY : GENERAL

American Society of Parasitologists. **Program and Abstracts of the Thirtieth Annual Meeting, Atlanta, Georgia, December 27, 28, 29, 30, 1955.** *J. Parasitology.* 1955, Dec., v. 41, No. 6, Sect. 2 (Suppl.), 55 pp.

This programme includes the abstracts and titles of papers submitted to the Annual Meeting of the American Society of Parasitologists in Atlanta, Georgia, in December 1955. "Parasitism and Parasitology" was the subject of the Presidential address by Dr. Clay G. Huff of the Naval Medical Research Institute, Bethesda. Altogether 130 titles were presented. Those subjects of special interest to the readers of this *Bulletin* included: schistosomes (13 papers), surveys for parasites (6), *Hymenolepis* (6), filarial worms (5), trypanosomes (5), amoebae (4), toxoplasms (4), hookworms (3), *Ascaris* (3), *Trichinella* (3), malarial infection of mosquitoes (3), *Fasciola* (2), *Paragonimus* (2), *Enterobius* (2), ticks (1) and leishmaniae (1). *H. J. O'D. Burke-Gaffney*

Kuntz, R. E., Lawless, D. K. & Mansour, N. S. **A Cursory Survey of the Intestinal Parasites of Natives living in Southwest Sudan.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 895–900.

Few parasitological surveys have been carried out in Southern Sudan and hence this report, based on the examination of stools of 79 persons from the vicinity of Wau, is of interest. The specimens were simultaneously fixed and stained by the MIF method [this *Bulletin*, 1954, v. 51, 311] and were subsequently examined by direct smear and brine flotation. *Entamoeba histolytica* was the most common parasite encountered, 67 per cent. of the donors being infected, two-thirds of them with the small race. Comparison of this figure with those in the returns of 5 hospitals in the Sudan showed that in the latter infection rates were very much lower, ranging from 0·1 to 7·2 per cent. *E. coli* and *Endolimax nana* were also common. The incidence of *Enteromonas hominis* was expectedly high at 5 per cent. but *Dientamoeba fragilis* was rare, being detected only once. The incidence of helminth infection showed

some unusual features; *Ancylostoma* incidence was 23 per cent. but *Ascaris* and *Strongyloides* were absent, and *Trichuris*, *Enterobius* and *Hymenolepis* infection rates were only 1 per cent. *Trichostrongylus* was found in 2 persons. *Taenia saginata* was not found although the majority of the donors were cattle-owning Dinkas. *Schistosoma mansoni* was present in 10 per cent. and this was regarded as low in view of the close contact of the people with water during hunting, fishing and bathing.

T. H. Davey

Kelley, G. W., Jr. **Intestinal Parasitism in an Irrigated Community of Western Nebraska.** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 901–7. [12 refs.]

This survey was carried out in an area which has been irrigated for many years in the hope that the results would indicate the effects, if any, which this agricultural method produced on community health. Moreover, since the labour force was largely composed of Mexican immigrants the survey was designed to compare their incidence of intestinal parasitism with that in the indigenous people. There were some 34,000 people in the country and the sample of 1,096 persons was selected at random to give a distribution of one or two families per square mile. The stool specimens were examined within 18 hours of being passed.

The incidence of intestinal parasitism was 23·2 per cent., *Entamoeba coli* being present in 17·8 per cent., *E. histolytica* in 3·7 per cent., *Endolimax nana* in 2·3 per cent. and *Giardia intestinalis* in 2 per cent. The additional helminth and other parasites recorded were not present at a significant level. When the donors were allocated to the following categories, non-Mexican whites, Mexican residents, immigrant Mexican labourers and American Indians, it was found that the immigrant Mexicans had the highest incidence of parasitism (77·5 per cent.) followed by the American Indians (54·5 per cent.), then by Mexican residents (37 per cent.), and finally the non-Mexican whites (18·2 per cent.). The incidence of *E. histolytica* infection among American Indians and immigrant Mexicans (36·3 and 31 per cent., respectively) was very much higher than in resident Mexicans (4·5 per cent.) and non-Mexican whites (1·5 per cent.). There was no marked difference between urban and rural populations such as would have been expected if parasitism was influenced by irrigation practices or contact with migrant labourers. Infection rates were, however, correlated with low standards of sanitation, e.g., privies rather than indoor toilets, littered yards and inadequate housing. The risk of parasitism was increased in families in which one member was infected, indicating that personal contact was more important in transmission than contamination of food or water. Water-borne epidemics of amoebiasis when they occur are apparently "triggered" by some unknown factor and it is suggested that the

importation of heavily infected Mexican labourers therefore constitutes a potential public health danger although at present no significant transmission to permanent residents is evident. *T. H. Davey*

Reusse, U. Zur Frage der Zystenbildung und des Lebenszyklus bei Trichomonaden unter besonderer Berücksichtigung von *Trichomonas foetus* und *Trichomonas muris*. [**The Question of Cyst Formation and Life Cycle in Trichomonads with special reference to** *Trichomonas foetus* **and** *T. muris*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, Oct., v. 6, No. 3, 348–61, 1 fig. [Numerous refs.]

Kresnik, V. O pnevmocističnih intersticialnih pnevmonijah dojenčkov. [**Pneumocystic Interstitial Pneumonias in Infants**] *Zdravstveni Vestnik*. Ljubljana. 1955, v. 24, Nos. 7/8, 239–41, 3 figs.

The author describes a new stain for demonstrating *Pneumocystis carinii* in tissue smears. A solution of myrtillin is prepared by soaking fresh or dried bilberries (the fruit of *Vaccinium myrtillus*) in 96 per cent. ethanol for 4–6 days; the extract is then strained through a cloth and filtered; 10 cc. of the solution are mixed with 1 cc. of 1 per cent. ammonium thiocyanate or aluminium sulphate, and 1 cc. of 1 per cent. lithium carbonate. Thin unfixed smears are flooded with stain while still moist; after 15–20 minutes the preparation is taken into 96 per cent. alcohol and is then dehydrated, cleared and mounted in balsam. The cytoplasm of the parasites is stained pale blue and the nuclei violet. Paraffin sections can be stained similarly after transfer to 96 per cent. alcohol. *D. J. Bauer*

Toyoda, T. [**Granuloma of the Stomach Wall with Eosinophilic Infiltration**] *Hirosaki Med. J.* 1955, v. 6, No. 3, 246–50, 7 figs. on 2 pls. [In Japanese.] English summary *55.

The granuloma contained an unidentified parasite.

Rossi-Espagnet, A. & Capone, M. Primi risultati del frazionamento elettroforetico di estratti proteici di organismi parassitari. [**Preliminary Results of Electrophoretic Fractionation of Protein Extracts from Parasites**] *Riv. di Parassit.* Rome. 1955, Oct., v. 16, No. 4, 225–9. 7 figs. [20 refs.]

The English summary appended to the paper is as follows:—

"After a brief review of the few data from the literature on this subject the authors expose their results from electrophoretic fractionation

of protein extracts of *Parascaris equorum*, *Taenia saginata*, Echinococcus cysts, *Cysticercus bovis*. Practical and theoretical importance of this research is underlined."

Mann, P. H., Harfenist, M. & de Beer, E. J. **The Effectiveness of Piperazine Citrate against Intestinal Helminths of the Cat and Dog.** *J. Parasitology.* 1955, Dec., v. 41, No. 6, 575–8. [13 refs.]

"Piperazine citrate was administered orally to dogs and cats at a rate of 100 mg./kg. daily for 10 consecutive days. This treatment was extremely effective against ascarids, somewhat effective against *Ancylostoma caninum* and *Taenia taeniaeformis*, but ineffective against *Trichuris vulpis* and *Dipylidium caninum*."

Lobo, M. B., Moreiras, M., Manceau, J. N. & Moraes, N. L. de A. Planejamento e execução de um inquérito coprológico. [**Coprologic Investigation: Planning and Execution**] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1954, June, v. 6, No. 2, 479–96. English summary.

See this *Bulletin*, 1956, v. 53, 249.

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Colonial Office. **Colonial Research 1954–1955. Colonial Insecticides, Fungicides and Herbicides Committee. Eighth Annual Report (1954–1955)** [Hall, W. J., Chairman] (pp. 223–49). Cmd. 9626. 316 pp. 1955, Nov. London: H. M. Stationery Office. [9s.]

The following types of investigation have been carried on under the aegis of the committee. *At the Colonial Insecticide Research Unit at Porton, England*: the sorption of insecticides by soils (including dried mud); efficiency of synthetic resin coatings containing insecticides; development of spraying installation on aircraft. *At Imperial College Field Station, England*: the contamination of insects by deposits of insecticides and the penetration of their integuments; the olfactory stimulation of tsetse flies. *At Rothamsted, England*: the persistence of

insecticidal films on glass plates and on plant foliage, under various conditions. *At Long Ashton, England*: the persistence and efficiency of fungicides in the field. *At the C.I.R. Unit, East Africa*: aircraft spraying experiments and other investigations on tsetse flies; investigations of house spraying against mosquitoes; miscellaneous chemical, physical and agricultural problems. *At Colonial Agricultural Insecticides Research Unit, East Africa*: work on pests of cotton and maize. *Biting Fly Research in Uganda*: preliminary surveys of local biting flies. *In Mauritius*: studies on the ecology of *Anopheles gambiae*. *Filariasis research, Fiji*: investigations to determine the importance of various vectors of *Wuchereria* and their habits. *Coconut Pest Research, Zanzibar*: trials of a DDT plus resin preparation for controlling the pest *Pseudotheraptus*. *Western Sokoto Malaria Control Scheme*: the C. I. Committee has provided a chemist who is investigating persistence of insecticide residues on walls. *Herbicides, Arboricides and Defoliants, East Africa*: aerial applications of defoliants. *Agricultural Research Unit of Experimental Agronomy, Oxford, England*: investigation of biochemical and physiological processes involved in leaf abscission.

This report also summarizes some research programmes in various colonies which are not under the aegis of the committee.

J. R. Busvine

Pinotti, M. Recentes aquisições sôbre resistência de insetos e variações de comportamento de anofelinos em áreas da América do Sul. [**Recent Observations on Insect Resistance and Anopheline Behaviour in South American Countries**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, Oct., v. 6, No. 4, 463–72. [27 refs.] English summary.

This paper summarizes the available information on development of insecticide resistant strains of medically important insects in South America. In general, it is noted that there is little experimental investigation of this subject; the data are sparse and often inconclusive. There is no record of insecticide resistance in any anopheline mosquito in this area, though it appears that *A. darlingi* is more zoophilic in some areas than others, and this may render control by DDT difficult in those areas.

Culex fatigans is certainly of naturally low susceptibility to DDT but the evidence for acquired resistance in some places is dubious. There is a report that *Aëdes aegypti* is developing resistance to DDT in Paramaribo, Surinam. House-flies are nearly everywhere resistant to DDT, but in some areas are still susceptible to BHC.

In addition to the foregoing, there are somewhat vague reports of DDT resistance of dog fleas in British Guiana, dog fleas, cat fleas and certain ticks (*Ornithodorus rudis* and *Argas columborum*) in Colombia, as well as cockroaches and ants in French Guiana. *J. R. Busvine*

Elliott, R. **Larvicidal Control of Peridomestic Mosquitoes.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Nov., v. 49, No. 6, 528–42, 4 figs.

In many parts of West Africa the regular storage of water in pots near dwellings provides breeding places for vectors of yellow fever, dengue, filariasis and even malaria. In the Udi Division of Eastern Nigeria, the habit of storing water is accentuated by the lack of adjacent sources in the dry season; many dozens of pots of water are kept in village compounds and the *Aëdes aegypti* breeding in them spread an epidemic of yellow fever in 1952. Some suppression of breeding was achieved by getting the local residents to cover the pots with clay lids, but this precaution is often neglected.

The author has investigated the value of insecticides for preventing breeding of *Aëdes* in such pots. Preliminary laboratory tests showed that the toxicity of an insecticide is dependent on its formulation. Thus, DDT was much more effective as a suspension prepared by diluting an alcoholic solution than from a wettable powder, but the reverse was true with dieldrin and gamma BHC. It was shown that dieldrin and gamma BHC are effective in actual solution in water but DDT is too insoluble to act in this way.

Practical trials were made with local baked-clay pots of about 2 gallons' capacity. The insecticides were added in the form of briquettes or pellets. Sand plus cement was the best material for these because the type made of plaster of Paris left a white deposit on the bottom of the pot. Tests of various mixtures showed that 5 parts sand to 1 part cement was most effective. Comparisons of 4 oz. briquettes and 10 gramme pellets showed that the latter gave out more of the total insecticide present and also remained effective for longer. DDT was not satisfactory in this form, since it only gave effective control for about 6 weeks. However, good results were obtained with dieldrin and lindane-quality gamma BHC. Ten gramme pellets of either of these insecticides, originally containing 16·6 per cent. active ingredient, were found to contain 9·2 and 5·2 per cent., respectively, after a year in water-filled pots. At this time they were effective in killing 100 per cent. *Aëdes aegypti* larvae in 24 hours.

The addition of insecticide-containing pellets to stored water appears to be an effective method of preventing breeding of mosquitoes. The author states that although dieldrin is 25 times more toxic to vertebrates than gamma BHC, it is one-sixtieth as soluble. At 26°C. its solubility is 0·05 part per million, which is well below levels considered unsafe.

J. R. Busvine

Laven, H. **Cytoplasmic Inheritance in** *Culex*. [Correspondence.] *Nature*. 1956, Jan. 21, v. 177, 141–2.

See also p. 400, VAN SOMEREN *et al.*, **The Mosquitos of the Kenya Coast; Records of Occurrence, Behaviour and Habitat.**

I. BIGELOW, R. S. & REIMER, C. **An Application of the Linear Discriminant Function to Insect Taxonomy.** *Canadian Entomologist.* 1954, Feb., v. 86, No. 2, 69–73.

II. ———— & LEROUX, E. J. **Distinct Morphological Differences between DDT-Resistant and Non-DDT-Resistant Strains of the House Fly,** *Musca domestica* **L.** *Canadian Entomologist.* 1954, Feb., v. 86, No. 2, 78–86, 5 figs. [11 refs.]

I. Mathematical procedures combining linear measurements of several parts of male grasshoppers of two species, which have overlapping forms in certain qualitative features generally used in specific differentiation, are shown to give accurate identification of up to 98 per cent. of specimens. The material was chosen as suitable for testing the advantages of this approach to detecting small morphological differences between races of insect. The original describes the mathematical calculations in detail; they are essentially standard statistical methods.

II. This paper provides an application of the methods of the first paper to the morphological recognition of individual flies of DDT-resistant and non-resistant house-fly strains.

Distinct morphological differences are reported between flies, *Musca domestica*, of a DDT-resistant strain and those of a non-resistant strain, both strains being maintained thus in the laboratory for many generations (Beltsville and Macdonald strains).

The following linear measurements were made for each strain on at least 225 specimens: (1) maximum width of second abdominal sternum, (2) maximum length of this same sternum, (3) width of frons between ptilinal sutures at the level of the junction of the second and third antennal segments, and (4) the length of the terminal antennal segment along its anterior surface. Of these the sternal width and frons width were highly diagnostic. In the Beltsville strain (DDT-resistant), sternal width was greater than 0·609 mm. and frons width greater than 0·59 mm. in, respectively, 95 per cent. and 85 per cent. of individuals. For the non-resistant (Macdonald) strain the same proportions of individual flies had measurements of these widths lower than 0·609 mm. and 0·59 mm. Further observations were made with other strains of house-fly, with the use of the ratio of the maximum width of the second abdominal segment to the length of this segment for comparison of the strains. Samples of 15 to 25 flies of each sex were measured. The mean ratios for eight strains examined varied from 0·910 to 1·207; the three DDT-resistant strains gave mean ratios over 1·037 while for non-resistant strains the values were 0·946 or less. A methoxychlor-resistant strain gave a mean

ratio of 0·962. This ratio served to separate individuals into members of the DDT-resistant and the non-resistant strains, since the range of variation about the means (using 3 times the standard error of the means) gave no overlap. Analysis of variance confirmed that the 3 DDT-resistant strains differed widely in this criterion from one another, but this did not apply within the group of non-resistant strains. In 2 of the resistant strains (Pollard and Bellflower) the ratio under discussion above was closer to that for non-resistant strains in males than in the females. A further ratio was examined, namely, length of the terminal antennal segment to width of frons and the data considered separately for each sex, since males have eyes closer together than females. The *mean* ratios of the DDT-resistant strains were again markedly different from those for the methoxychlor-resistant and non-resistant strains, although considerable overlap occurred between the two groups.

In discussion of the results it is suggested that these morphological differences are genetically linked with factors producing DDT-resistance. It is, however, pointed out that any single ratio of the kind investigated need not be associated with resistance in all resistant strains. The paper closes with examples of how several linear measurements or ratios of them may be combined to give discriminant functions of greater value in the comparison of the morphology of strains, the degree of precision rising from 76 to 90 per cent., by adopting an analysis involving more than one measurement or ratio. Since DDT-resistance probably has a complex genetic basis, the combining of several different measurements seems more likely to detect morphological difference associated with several genetical components of resistance, particularly where the degree of resistance is not high. A final suggestion is that this procedure might prove to be an accurate method of detecting DDT-resistance in wild populations of house-fly. But there seems scope first for establishing a series of morphological features involving linkage with most of the genetic factors of DDT-resistance so that the precision of the discriminant function derived in comparisons would be high. *D. S. Bertram*

Morrison, F. O. & LeRoux, E. J. **House Fly Head as Site of Lethal Action of DDT.** *Canadian J. Agric. Sci.* 1954, v. 34, No. 3, 316–18. [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Dec., v. 43, Pt. 12, 188.]

DDT (2 μg. per fly) was applied to the labella or to the tibio-femoral membrane of one leg of males of *Musca domestica* L. that had emerged four days before. Treatment of the labella gave 83 per cent. kill in 24 hours, and treatment of the leg gave 68 per cent. When the cervical region of each fly was ligated with cotton thread, the mortality percentages were 91 and only 31 for flies treated on the labella and leg, respectively, and 14 for flies not treated with DDT.

When DDT labelled with ^{14}C was used, and the heads and bodies of the flies were separated 24 hours after treatment and tested for radio-activity, all the radioactivity applied was recovered and the percentages of it recovered from the heads of non-ligated and (in brackets) ligated flies were 70 (98) after treatment on the labella and 5 (less than 1) after treatment on the leg. Radio-activity in the haemolymph of flies treated on the leg could be detected 30 seconds after treatment, rose fairly rapidly during the first five minutes and then remained at a more or less constant level for 24 hours. It is concluded from these results that DDT is translocated in the haemolymph of the fly and that the head is probably a critical region for its lethal action.

DeFoliart, C. R. & Pelton, E. C. **A Case of Human Intestinal Myiasis caused by** *Muscina stabulans* **(Fallén).** *Amer. J. Trop. Med. & Hyg.* 1955, Sept., v. 4, No. 5, 953–5. [11 refs.]

The authors refer to the few cases of human myiasis due to the larvae of *Muscina stabulans* [see, for example, this *Bulletin*, 1921, v. 18, 26; 1925, v. 22, 453] and then record a case from Laramie, Wyoming, in a child aged 13 months.

Many live larvae were found in the stool, but the number was not increased by the administration of piperazine citrate. The child had complained of abdominal cramps for a week. The origin of the infestation was unknown, but it is unlikely that the stool had been contaminated from an outside source.

The larvae were identified as those of *M. stabulans*. This is believed to be the second case reported from North America, the first having been as long ago as 1912. *H. J. O'D. Burke-Gaffney*

Arthur, D. R. *Ixodes redikorzevi redikorzevi* **Olenev, 1927 (Ixodoidea, Ixodidae) in Egypt with a Consideration of its Synonymy.** *J. Egyptian Pub. Health Ass.* 1955, v. 30, No. 2, 39–56, 23 figs. [10 refs.]

" 1. Egyptian males and a female of *I. redikorzevi redikorzevi* Olenev, 1927, are redescribed. This tick is very rare in Egypt and is probably a relict species nearing extinction there.

" 2. The Egyptian specimens are compared with *Ixodes transcaucasicus hystrix* Schulze, with which there is substantial agreement.

" 3. The main characters of *Ixodes theodori* are reviewed.

" 4. The validity of *hystrix* as a subspecies is dismissed as untenable and synonymy of *transcaucasicus* and *diversicoxalis* is discussed. The characters of *I. redikorzevi redikorzevi* and *I. redikorzevi emberizae* are outlined, and in view of the undoubted similarity of *I. transcaucasicus* (= *I. diversicoxalis*) to the former subspecies it is considered justifiable to sink *I. transcaucasicus* in synonymy with *I. redikorzevi*. *I. theodori*

is sufficiently distinct from *I. redikorzevi redikorzevi* to merit at least subspecific rank.

"5. Since ticks of this group are not infrequently taken on man, the presence of this species in Egypt is of special interest."

Brown, J. H. **Colorado Tick Fever in Alberta.** *Canadian J. Zool.* 1955, Dec., v. 33, No. 6, 389–90.

"The first record of Colorado tick fever virus in Alberta was made following the laboratory examination of 250 unfed *Dermacentor andersoni* ticks collected west of Calgary on May 11, 1953. On June 12, 1954, a further collection of 100 unfed ticks of the same species made in the same general area was also positive, and on June 28, 1954, a collection of 30 unfed *D. andersoni* made on pasture land at Brooks, about 165 miles east of the location of the previous positives, was also positive. Hence it would appear that Colorado tick fever virus is widespread in the *D. andersoni* population in Alberta. No human cases have been recognized in Alberta."

Wigglesworth, V. B. **The Role of the Haemocytes in the Growth and Moulting of an Insect, *Rhodnius prolixus* (Hemiptera).** *J. Exper. Biol.* 1955, Dec., v. 32, No. 4, 649–63, 8 figs. [17 refs.]

Livadas, G. & Petrides, I. **The Susceptibility of Body Louse to DDT in Greece.** *Riv. di Parassit.* Rome. 1955, Oct., v. 16, No. 4, 237–9.

"From an investigation made in 62 rural settlements of Greece and in some of the Athens asylums, the following conclusions were drawn: 1) Even in the most backward rural settlements of the country, the body louse does not occur frequently, if at all, 2) no development of resistance by that insect to DDT was observed."

Mullins, L. J. **Structure-Toxicity in Hexachlorocyclohexane Isomers.** *Science.* 1955, July 15, v. 122, 118–19, 1 fig.

Ward, J. & Burt, P. E. **The Persistence and Fate of DDT on Foliage. II.—Comparative Rates of Loss of DDT Deposits from Glass Plates and Growing Leaves.** *Bull. Entom. Res.* 1956, Jan., v. 46, Pt. 4. 849–68, 4 figs. [16 refs.]

MISCELLANEOUS PAPERS

MEYER, K. F. **The Zoonoses in their relation to Rural Health.** *Univ. California Publ. in Pub. Health.* 1955, v. 3, No. 1, 1–49, 8 charts. [Numerous refs.]

Since the conclusion of the second world war, interest in the zoonoses has increased greatly and their importance in human welfare is being increasingly recognized. This article reviews the problem broadly and makes recommendations for improving knowledge concerning these diseases and for a scheme of organization for their control. In the introductory pages it is pointed out that there are at least 86 infections of domestic or wild animals which constitute a present or potential threat to human health and to the economic status of rural populations. Public health workers have only recently recognized the importance of these infections to rural communities. Their distribution and incidence are incompletely known because reporting is inadequate owing to lack of diagnostic facilities and the absence of compulsory or voluntary notification. Before their prevalence can be appraised and documented an adequate system of notification of animal diseases must be introduced and proper statistics of animal morbidity and mortality collected.

Twelve of the zoonoses of world-wide importance are discussed briefly together with their geographical distribution and principal reservoirs, followed by a discussion of 11 of those of localized importance. They include a number of the most important infections in the tropics. The difficulty of applying present knowledge and techniques on a scale large enough to reduce the problem is stressed, and the lack of basic knowledge concerning many of these diseases and their complicated chains of transmission is pointed out. The organization of control is discussed and its fundamental requirements are stated. The latter will include a public health veterinary service devoted to protecting society against the zoonoses and to providing food hygiene, health education and sanitary measures in rural environments. This programme envisages, among other requirements, an adequate public health service, veterinary personnel familiar with the zoonoses to carry out the necessary technical procedures, cooperation between physicians, health workers and veterinarians, and between the veterinary public health services and the agencies responsible for agriculture and animal husbandry. Though these requirements have been met in some countries, in many others where facilities are inadequate the situation must be met by international action. A scheme of organization for control is proposed which outlines the national, regional and local requirements. The knowledge and training of veterinarians must be recognized and used in public health programmes, and the stock owner must be educated in the promotion of rural health. Veterinary assistants, with training similar to that of sanitary staff, will be necessary for local rural units. *T. H. Davey*

Sergent, Ed. La médecine française en Algérie. [**French Medical Services in Algeria**] *Arch. Inst. Pasteur d'Algérie.* 1955, Sept., v. 33, No. 3, 281–5.

Asprey, G. F. & Thornton, Phyllis. **Medicinal Plants of Jamaica. Part III.** *West Indian Med. J.* 1955, June, v. 4, No. 2, 69–82. **Part IV.** *Ibid.*, Sept., No. 3, 145–68. [62 refs.]

REPORTS AND SURVEYS

Congo Belge. Rapport Annuel de la Direction Générale des Services Médicaux 1954. [**Annual Report of the Medical Directorate General, 1954**] 123 mimeographed pp. [1955.]

This Report records an all-round increase in staff during the year and a satisfactory flow of students passing out of local teaching establishments, which is attributed to better education and selection of candidates.

It is noted that there were 2 outbreaks of smallpox during the year, one in the Congo region in the Orientale Province and one in Elisabethville. There were 5,214 cases with 170 deaths. Appropriate measures brought the outbreaks under control. There was an outbreak of poliomyelitis in Elisabethville and many cases were also reported in the other provinces. The number of cases (deaths in brackets) were Europeans, 40 (4), Africans, 710 (39). Pentamidinization continued to bring about a reduction in the incidence of sleeping sickness which was 0·04 per cent. compared with 0·06 per cent. in 1953. Vigilance is still required, however, and the existence of "residual trypanosomiasis" is stressed. The usual details are given of sleeping sickness work in the different areas.

As a result of the programme referred to in the last Report [this *Bulletin*, 1954, v. 51, 1316] 195,761 cases of leprosy were treated.

Despite the natural obstacles to extending anti-malarial work throughout the vast areas involved, extensions of control were made. Trials of chemoprophylaxis with pyrimethamine and amodiaquine in different areas are described.

There were 42 cases of plague in the Lake Albert region with 22 deaths and no cases in the Lake Edward region. The difficulties in the way of control measures are discussed.

There was only 1 case of yellow fever reported during the year, in Tshela (Lower Congo).

The usual full details are given of other diseases and activities. In

some cases, incidence has fallen and in others it has risen: but some of this can be accounted for by more extensive diagnosis.

For all this informative matter, the original report should be consulted.

H. J. O'D. Burke-Gaffney

BOOK REVIEWS

Hill, A. Bradford [C.B.E., D.Sc., Ph.D., F.R.S.]. **Principles of Medical Statistics.** 6th Edition, Revised and Enlarged. pp. ix + 314, 13 figs. 1955. London: The Lancet, Ltd., 7, Adam Street, Adelphi, W.C.2. [10s. 6d.]

Every appreciation of results is inevitably numerical, whether the results are of some formal experiment intended for publication or of a purely private trial for self-information, and in most cases appreciation turns on the examination of the difference between two figures. The findings are inevitably statistics and their examination is inevitably by statistical technique, which may be bungling, amateur or professionally precise, but is carried out for the most part by persons without special training in the discipline. So it is that some workers find it obscure and even repellent, some professional statisticians find constant adverse criticizing distasteful and neither party to the transaction is happy. Professor Hill sets out as a conciliator to show how statistics can be used not only by the critic but also by the producer to set a stage which will receive good notices. In his exposition the statistical approach is very largely one of applied common sense, but common sense which very sorely needs direction into particular channels of interest usually ignored by the novice. He devotes much greater space and illustration to these channels than to the detailed techniques of their navigation. The previously obscure and repellent element comes in the end as a welcome tool after adequate persuasion of its need, and no one need fear its arrival. His lapses into dogmatic assertion ("It is a *sine qua non* with graphs, as with tables . . .", p. 38) are well relieved by liberal non-observance (see pp. 52, 60, 158, 164, 182, 199) which shows that common sense overrules it.

He first expounds the presentation and handling of data so that the information they carry may be made visible and understood, giving lucid, comprehensible accounts of the meaning of significance which should remove that characteristic from its vague but dominating rôle to that of a rational standard of comparison which all can understand. In summarizing he gives some badly needed advice, especially on the size of samples to be drawn. He then passes to the rôle of critic, illustrating common fallacies, how they arise and may be avoided. In this he is less

happy: for many cases he gives hypothetical figures in which few will fail to see the inherent source of error, and in one actual example (p. 204) he disguises his distaste for adverse comment on an author.

The chapter on the rôle of the producer, showing how experiments may be designed to avoid statistical pitfalls, is new in this edition and wholly good. The thesis is developed in relation chiefly to clinical therapeutic trials but with sufficient breadth and enough reference to make it applicable to medical experiments of most types, including field surveys.

The partnership of statistical method and tropical medicine is far from young, some of Christophers's applications to the epidemiology and immunology of malaria were well ahead of contemporary temperate use. Some of the techniques have become rule of thumb, but they are not used enough and rule of thumb should not be the aim. The application to tropical medicine can be peculiarly apt and easy, because so many conditions are susceptible to precise objective measurement, in such terms as parasites, no parasites or a classified density of parasites, by which vague subjective impressions become needless. The field surveys which were the main structure of the subject needed the statistical approach and to a small extent received it, but the emphasis now turns to the controlled trial of forms of therapy and prevention which need it urgently if frustration of effort is not to be the result of many. An understanding of the statistical approach and of simple statistical technique should be part of the stock-in-trade of every worker who wishes to inform himself or others, and it would be hard to find a more effective or pleasant method of acquiring it than through Professor Hill's book.

G. Macdonald

Simmons, James Stevens [S.B., M.D., Ph.D., Dr.P.H., S.D. (Hon.) & Gentzkow, Cleon J. [M.D., Ph.D.]. [Edited by.] **Medical and Public Health Laboratory Methods (Successor to Fifth Edition of Laboratory Methods of the United States Army).** 1191 pp., 115 figs. & 9 coloured pls. 1955. London: Henry Kimpton, 25, Bloomsbury Way, W.C.1. [£6. 15. 0.]

The many laboratory workers who have profited, during the last 37 years from the *Laboratory Methods of the United States Army* will particularly welcome the successor to its fifth edition. The new title is indicative of the broader scope and wider application of the work, and this is reflected in the great increase in the size of the book and in the range of subjects covered.

This new edition has been revised and rewritten to include important new information which has become available since its predecessor was published in 1944. It is edited by Dr. James Stevens Simmons (whose death before the book was completed is so widely regretted) and Dr. Cleon J. Gentzkow; and no less than 35 contributors, many of them well-known experts, have collaborated in their special fields.

The 52 chapters are arranged in 11 parts, namely Clinical Pathology, Chemistry, Mycology, Bacteriology, Rickettsiae and Filterable Viruses, Protozoology, Helminthology, Entomology, Pathology, Special Veterinary Methods and Statistical Methods. Here a reviewer is at first struck by two points which seem to invite criticism, namely a great variation in the emphasis on particular subjects and a certain dichotomy in their arrangement. For example, while chemistry occupies some 340 pages and bacteriology and viruses 250, protozoology has only 80, helminthology 40, and entomology 60. Again, certain subjects are divided among different Parts, such as urine examination and serological tests. On further reflection, however, this is clearly intentional and part of a carefully planned arrangement, whereby the laboratory worker may find the subject he is most likely to need under the heading where he is most likely to need it.

The section on clinical pathology is full and includes detailed descriptions of some of the newer serological tests for syphilis; and that on chemical methods exhaustive, for it includes not only clinical methods, but the examination of water, sewage, industrial wastes, foods of animal origin and toxicological methods.

Bacteriology is presented in a very practical form and, although the emphasis is very properly on methods, considerable descriptions of species of medical importance are included. This section includes food poisoning, milk and dairy products, shellfish, water, sewage and a short chapter on antibiotics in which a long table of the activity of six well-known antibiotics is given. General bacteriological technique is fully covered and formulae are given for some 50 culture media. Considerable attention is given to the diagnosis of virus and rickettsial diseases and useful tables outline the diagnostic methods used. Another table lists the size of viruses.

Tropical workers may feel disappointed at the relatively modest presentation of protozoology, helminthology and entomology: but the information given is essentially practical, the details of technical method considerable, and useful diagrams, tables and keys provide a much fuller coverage of the subject than the number of pages would suggest. All the essentials for the diagnosis of these infections are there. In the entomological section keys are given to classes, orders, families and tribes of medical importance, but the author wisely refers his readers to suitable reference works for the determination of genera and species. Pathology and histology are well served, and a very large number of formulae and methods for microscopic technique are set out. A valuable section deals with the diagnosis of specific diseases. Here the reader will find many techniques appropriately applied.

Modern scientific medicine is increasingly dependent on statistics, and an unusual and welcome feature of the book is a section on statistical methods, the pages of which " pretend to be nothing more than a guide to the practical application of a few simple statistical procedures ". It

deals with rates and ratios, frequency distribution, correlation, and significant differences.

Among the many very helpful features of the book are the numerous tables of classification and methods of differential diagnosis, the maps showing geographical distributions of several diseases and the bibliographies following the text of the various sections. It is inevitable in the preparation of so immense a book that most of these are not later than 1953, but it is to the credit of the editors that there are references up to the current year. There is an index of nearly 50 pages. It is remarkable that so compendious an undertaking covering alike clinical, public health and military laboratory work and providing such an immense amount and variety of detailed information should be contained within 1,200 pages. It is well and clearly printed and fully illustrated.

The reviewer has been unable to recall any diagnostic aid ordinarily required by the general medical laboratory worker which is not catered for in this volume. It is the kind of book which those for whom it has been written will find themselves constantly consulting, with profit and, indeed, with pleasure. *H. J. O'D. Burke-Gaffney*

World Health Organization. **Pharmacopoea Internationalis.** [International Pharmacopoeia] First Edition. Vol. II. pp. xx + 350. 1955. Geneva: Palais des Nations. [35s.; $6.75; Sw. fr. 20.–.]

[Review appears also in *Bulletin of Hygiene*, 1956, v. 31, May.]

The first volume of the International Pharmacopoeia was published in 1951 [this *Bulletin*, 1952, v. 49, 341]. It was designed to provide internationally acceptable standards and nomenclature for the important drugs used in medicine, and to serve as a basis for national pharmacopoeias published by authority and backed by law. Any nation adopting the International Pharmacopoeia or part of it, would of course add descriptions and standards for drugs and preparations of local importance. The Pharmacopoeia owes much to the energy and commonsense of the late Dr. C. H. Hampshire, who acted as Chairman at most of the sessions of the Committee.

The 4 years which have elapsed since the publication of Vol. I have enabled the editors to include reliable monographs for the antibiotics (benzyl penicillin, chloramphenicol, streptomycin, dihydrostreptomycin, chlortetracycline and oxytetracycline) and for a number of the newer and more potent synthetic drugs. Vol. II therefore includes cortisone, cyanocobalamine, noradrenaline and sodium *p*-aminosalicylate; the newer analgesics are represented by methadone, metopon and oxycodone, and there is a selection of antihistamine drugs such as diphenhydramine (Benadryl), promethazine (Phenergan), antazoline (Antistin) and mepyramine (Anthisan). For use in the tropics, the original selection of

drugs in Vol. I is supplemented by amodiaquine (Camoquin), chlorophenothane (DDT), hydnocarpus oil, oxophenarsine, dichlorophenarsine and pentamidine dimethylsulphonate. Standards are given for tryparsamide, mepacrine methanesulphonate, penicillin and some local anaesthetics for use in the preparation of injections.

Preparations of vegetable origin occupy only a small part of the volume, and are represented by 8 tinctures, for which methods of preparation and assay are given. Monographs for 51 tablets and 69 injections are included. Local preferences for the amount of drug contained in tablets and in solutions for injection differ, and for this reason no fixed proportion of drug is specified. Thus the standard for tablets (compressi) is given in the form: " the average weight of [drug] in the tablets is not less than [x] per cent. and not more than [y] per cent. of the prescribed or stated amount of [drug]." The permitted limits vary with the ease of determination and purification of the drug.

There are 26 appendices, giving helpful information upon the preparation of reagents, the conduct of chemical and biological assay processes and other matters. There is a table of usual and maximal doses for adults of drugs in Vol. II, and a separate list of doses for children, which covers all the drugs in both volumes. This is a useful table: the doses are not calculated as fractions of the adult dose but are those which have been specially established as suitable for children. The table gives doses for 2 age-groups: up to 30 months and from 30 months to 15 years. Another table lists the International Biological Standards and Reference Preparations held at the Statens Seruminstitut, Copenhagen, and at the National Institute for Medical Research, London. It gives details of the size of the unit and the form in which each preparation is dispensed.

In addition, there is an " annex ", included at the request of the Subcommittee on Serology and Laboratory Aspects of the WHO Expert Committee on Venereal Infections and Treponematoses. It describes characteristics and fixes standards for solutions of cardiolipin and lecithin for use in serological tests. The index covers both volumes.

The International Pharmacopoeia has been most carefully prepared and produced and there are few faults to find. The binding, like that of Vol. I, is clean and restrained in design, the paper is light in weight and of the right thickness for a book which is to be well used. The type is clear. The structural chemical formulae, which appear to have been printed from blocks, leave something to be desired. They have something in common with the formulae printed in the British Pharmacopoeia of 1948; these were discarded in the more recent 1953 edition and replaced with excellent formulae put together by the compositor. In order to make a neat index, page references in the 2 volumes are distinguished by a difference of boldness of type used for the page numbers. This is not a very successful manoeuvre: the nature of the paper and the type does not make for clear distinction between the 2 type-faces.

The International Pharmacopoeia Volume II is available in English

and in French and will soon appear in Spanish. It deserves a high measure of success. *L. G. Goodwin*

Rees, Charles William [Ph.D.]. **Problems in Amoebiasis.** pp. x + 119, frontispiece & 18 figs. 1955. Springfield: Charles C. Thomas, Bannerstone House, 301–327, East Lawrence Avenue, Ill., U.S.A. Oxford: Blackwell Scientific Publications, 24–25, Broad Street [34s.]

The volume has been written by a laboratory worker well known for his contributions in this field and is therefore based on a wide practical knowledge. The subject of amoebiasis is considered from all angles and there is a final chapter by a colleague, C. A. Imboden, on the clinical aspect of the disease. From the time of the discovery of *E. histolytica* by Lösch in 1875 controversy centred on whether this organism was actually the cause of dysentery. It is doubtful if the complete answer is yet available. Many basic questions concerning *E. histolytica* have yet to be settled, but through the cooperation of workers from all branches of science, progress has been substantial.

Methods of diagnosis are obviously of paramount importance and to the tyro are a source of great difficulty. Protozoologists naturally prefer the direct method of diagnosis by seeing the parasite under the microscope. Such a method may be aided by concentration and culture techniques, by animal inoculation or serodiagnosis. These methods are discussed in some detail and all appear to suffer from some defect. In culture procedures the use of antibiotics such as penicillin and streptomycin has proved a boon in preventing overgrowth by bacteria. The chief value of the serodiagnosis methods is undoubtedly in cases of extra-intestinal amoebiasis. The great advance made by Boeck and Dobohlav in 1925 when they cultured *E. histolytica* in presence of a mixed bacterial flora has now led to cultures in which only a single bacterial species is present, and to the more novel combination of *E. histolytica* with *T. cruzi* described by Phillips. These advances have allowed a study of encystation, excystation and metacystic development to be followed, as well as the direct effect of various chemical agents on cysts and trophozoites. The problem of continued growth of *E. histolytica* in the absence of bacteria is still unsolved.

When dealing with the experimental chemotherapy of the disease the author briefly traces the history of the introduction of drugs for treatment of the infection. The use of emetine, although a toxic substance, was a marked advance. Then followed employment of aromatic arsenicals, hydroxy-quinolines and thioarsenites. Chloroquine first used as an anti-malarial proved successful in the treatment of hepatic amoebiasis and lacks the toxicity of emetine. The activity of a number of antibiotics has been reported. No less than 27 substances,

including antibiotics, are now in current use in treatment, and this suggests that some at least are inefficient. Progress in the field of malaria chemotherapy has far exceeded that in the search for amoebicides. Although *in vitro* methods of testing amoebicides are probably more informative than those available in malaria the correlation with *in vivo* results is in general poor. Selection of an experimental host for *in vivo* tests is difficult. The use of germ-free animals offers possibilities, but the practical difficulties must be formidable. The final chapter, which deals with clinical aspects of amoebiasis, makes a suitable ending and will be appreciated by physicians.

This slim, informative volume, containing so much useful information, is printed on excellent paper and appears to be free from typographical errors. It seemed to the reviewer unnecessary to devote the whole of p. 28 to the drawing of a centrifuge tube. The maps on pp. 10 and 11 also appear unnecessary for the general reader. Where methods are in dispute a considered opinion is put forward by the author. There is a valuable list of references. It is doubtful whether the statement on p. 108 that " On the basis of present knowledge, all infections with *E. histolytica* should be treated "—would meet with general acceptance. *J. D. Fulton*

DALMAT, Herbert T. **The Black Flies (Diptera, Simuliidae) of Guatemala and their Role as Vectors of Onchocerciasis.** pp. vii + 425, numerous illustrations. 1955, Apr. 5. Washington: Smithsonian Institution.

A study of human onchocerciasis in Guatemala was sponsored by the Ministry of Health of the Republic of Guatemala, in association with several other American bodies, and aided by funds from the U.S. Public Health Service. A Laboratory of Onchocerciasis was established at San Pedro Yepocapa in Guatemala and the author used this as the base for his studies on Guatemalan simuliids from 1947 to 1953. This book brings together the mass of information which was obtained; a good deal of the author's own work has already been published as scientific papers and abstracted in this *Bulletin*, but it is now condensed and coordinated with other information within this single volume.

Rather more than half of the text is about the systematics of the flies and includes keys to genera and species. There are specific keys to larvae as well as to pupae and males and females. Complete descriptions of all species in all stages follow, and facts are recorded for the origins of type material and where they are now kept. Some line drawings of important parts are provided at the beginning of the section, and 43 plates containing 429 figures of specific differences are grouped together later in the book. [It is difficult to see why these should be removed by a hundred pages from the section to which they apply.]

Numerous maps, and many excellent photographs of the habits of the

people and the breeding places of blackflies, illustrate the text. Much detail about the biting habits of the different species of *Simulium* in relation to different hosts and biting sites, relative numbers of species, and so on, is condensed in tables of which there are 35 in all; some of the tables are in appendices which also include lists of plants found in *Simulium* infested regions and a general faunal list for the region of San Pedro Yepocapa. Sections of the book deal with the importance of blackflies as pests and vectors of disease, the geography and climate of the territory as it affects fly incidence and the epidemiology of onchocerciasis. There is a good deal about the characteristics of the different streams and water courses in Guatemala in relation to the breeding of different species of blackfly. Methods of field study are described and illustrated. Distribution of species within the country is minutely detailed. As regards life cycle and ecology of species, most attention is given to the adult stage of *S. ochraceum*, *S. metallicum*, and *S. callidum*, the 3 principal anthropophilic species concerned in the transmission of onchocerciasis. When dealing with larval biology, it has been possible to widen the scope of the subject to include both the anthropophilic and zoophilic species. There is then much information on the aquatic biology of about 35 species.

In a concluding section on vectors of *O. volvulus*, the incriminating evidence is considered for several anthropophilic species. *S. exiguum* and *S. haematopotum* are found at the lower altitudinal limit of the endemic zones for onchocerciasis and *S. veracruzanum* towards the upper limits. *S. ochraceum* occurs mainly in the endemic zones and in substantial numbers; it is a tenacious feeder not easily dislodged once started; it prefers a high relative humidity accompanied by sunny weather, conditions which prevail in the coffee-growing hill regions where onchocerciasis is commonly found. It is the species which breeds most successfully in the "infant" and "young" streams which are characteristic of the 3,000 to 5,000 ft. altitude at which the coffee-growing regions occur on the Pacific slopes of the mountains. *S. metallicum* and *S. callidum* do not combine these characteristics so well. Although *S. metallicum* adults often outnumber *S. ochraceum*, it is actually less anthropophilic than *S. ochraceum*; *S. callidum* is sporadic and never abundant. Breeding of *S. callidum* and *S. metallicum* is commoner in larger watercourses, associated with zoophilic species. *S. metallicum*, in contrast to *S. ochraceum*, is widespread throughout the country from the coastal region to over 6,000 ft. in much of which onchocerciasis is absent. *S. metallicum* is generally more frequently infected with onchocercal larvae than *S. ochraceum*. This may be due to the occurrence also of horse or cattle infections in *S. metallicum* (both these domestic animals have an onchocercal infection) and to a relatively greater death rate in freshly infected *S. ochraceum*, this species feeding much more voraciously than *S. metallicum*. There is need, too, to explain the presence of *S. ochraceum* in some areas in the absence of onchocerciasis.

The infection may not have been introduced. Flight capacity and the life-span of infected *S. ochraceum* are less than for uninfected individuals. This could cause a lesser distribution of the disease than of the fly itself. On the other hand, the behaviour of *S. ochraceum* where the disease is absent may be different as regards anthropophilism and susceptibility of the fly to infection.

The author concludes that *S. ochraceum* is the most efficient and important vector of human onchocerciasis in Guatemala, that *S. metallicum* is a good secondary vector, and that, although not usually concerned, *S. callidum*, *S. haematopotum*, *S. veracruzanum* or *S. exiguum* may be important under certain local conditions in which the *S. ochraceum* population is low. Apart from a mention of the advisability of controlling *S. metallicum* as well as *S. ochraceum* for the control of human onchocerciasis, there is little or no attention given in the whole book to practical control measures. It is clearly intended to provide the biological data on which control measures can be based soundly. There are about 130 references. The book is well made and the line drawings, photographic and tabular matter are excellent. *D. S. Bertram*

JEFFRIES, Charles [K.C.M.G., O.B.E.]. **The Colonial Office.** With a Foreword by Thomas LLOYD, G.C.M.G., K.C.B. 222 pp., 1 diagram & 1 folding map. 1956. New York: Oxford University Press Inc. London: George Allen & Unwin Ltd. [15s.]

Although, as the author says, " colonialism " is a word of bad reputation in some international circles, this survey of the administrative, political, economic and social activities and responsibilities of the Colonial Office belies that reputation. The book provides a valuable outline of all branches of Colonial administration, dealing as it does with the Secretary of State and his functions, the background of Colonial Office work in each of the various territories, the organization of the Colonial Office and different aspects of Colonial administration ranging from international relations to students from overseas. The book deals mainly with facts and is always sober and modest but never dull. It makes it abundantly clear that the principles by which the Colonial Office is guided are—as stated by Sir Cosmo PARKINSON, a former Under-Secretary—just dealing, honesty of purpose, and humanity. *John Rathborn*

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